Kew Bulletin

FORMERLY THE "BULLETIN OF MISCELLANEOUS INFORMATION"

PUBLISHED FOR THE ROYAL BOTANIC GARDENS, KEW

Volume 14, No. 1

Review of the work of the Royal Botanic Gardens, Kew, during 1958

General

The Director, Dr. George Taylor, has been honoured by the University of Göteborg, who conferred upon him the honorary degree of Ph.D., in recognition of his service to botanical science.

The Director attended a congress in Washington, D.C., as a delegate to the International Council of Scientific Unions. Subsequently he visited a number of well-known gardens in the United States, among them Mr. du Pont's garden at Winterthur, the Longwood Gardens, New York Botanical Garden, Washington Botanical Garden and the Morton Arboretum, Philadelphia.

Past and present members of the staff have received the following honours:—Dr. W. B. Turrill has been elected a Fellow of the Royal Society and awarded the Gold Medal of the Linnean Society for his distinguished services to Botany. Dr. J. Hutchinson received a Darwin-Wallace Centenary Silver Medal in recognition of his work on the classification of flowering plants. Mr. J. R. Sealy was awarded the Veitch Memorial Medal in silver and £25 by the Royal Horticultural Society for his 'Revision of the genus *Camellia*', which was published at the end of September. Mr. Pearce was elected an Associate of Honour of the Royal Horticultural Society.

Mr. C. E. Hubbard continued to serve on the 'Advisory Committee on Research designed to improve Sea Defences'. Mr. W. M. Campbell spent three months on the island of Dominica and drew up a scheme for the rehabilitation of the botanical gardens there.

The Herbarium

Each year since 1946, as the adverse effects of the war have become less and less apparent, there has been a gradual yet noticeable increase in the demand for the services of the Department by the general public, and by private and official bodies and organizations at home and overseas. To meet these demands there have been increases in the scientific and ancillary staffs which, together with the constantly growing numbers of visitors consulting the collections and library, have presented considerable difficulties in the provision of adequate working space. Moreover, as a result of our floristic and monographic studies, botanical expeditions and advisory services, a great profusion of desirable specimens, increasing in quality and quantity, has reached Kew from all parts of the world. To provide accommodation for these herbarium collections and for the yearly intake of botanical literature practically all suitable portions of the buildings have been fitted with cabinets or shelving, and even half the working tables have been replaced by table-cabinets. It is anticipated that all vacant spaces will have been filled by cabinets or shelving by the end of the coming year.

During 1958, 68,124 specimens were received, of which 3,034 were purchased, mainly by the Bentham-Moxon Trustees; the remainder coming by way of exchange or presented for determination. The total number showed a marked increase over that for 1957. It was made up of a great variety of collections, large and small, many parts of the world being represented, although the countries of the British Commonwealth—especially those of tropical Africa—predominated. Duplicates numbering 17,039 were presented to other herbaria.

In connection with the preparation of various Floras and for monographic studies, 5,928 specimens were borrowed from other institutions whilst 6,973 Kew specimens were lent to British and overseas herbaria. Among the sheets obtained in this manner for examination were numerous types, the majority of which were photographed before return.

The number of specimens mounted, 72,015, showed a considerable increase over that for 1957 and was higher than in any year since the war. The number of enquiries dealt with, 3,589, was about 400 above that of the previous year. It included requests for information on a great variety of botanical subjects, besides numerous fresh specimens for determination, in many instances from private persons, demonstrating a wide and active interest in wild and cultivated plants.

Staff

Mr. R. D. Meikle and Mr. D. A. Reid were promoted Principal Scientific Officer and Senior Scientific Officer respectively on the 1st October. Mr. W. D. Clayton, B.Sc., A.R.C.S., of the Ministry of Agriculture, Nigeria, joined the staff as a Senior Scientific Officer in October to work on the *Gramineae*.

Mr. Ernest Nelmes retired on 31st December after nearly 38 years in the service of Kew. For much of this time he was engaged in the Library, first as Assistant and later as Librarian when he rearranged the books on the subject basis in use today. During and since the war years he had been in charge of the *Cyperaceae*. The results of his investigations in this family,

especially on the genus *Carex* and on the African species of *Scleria* and several other genera, have been published in numerous papers.

Mr. P. G. Wilson resigned in February and left Kew in April to take up an appointment as botanist in the Adelaide Botanic Garden Herbarium, South Australia.

Miss D. Jepson, Assistant Librarian, left at the end of January, her place being taken in June by Mr. R. Davidge who was promoted to Librarian Grade III.

Dr. H. Huber of the Colonial Office staff at Kew, who was working on the revision of the 'Flora of West Tropical Africa', resigned his appointment in May to take up a position as Keeper to the Botanic Garden of the University of Würzburg, Bavaria. His place was filled in October by the appointment of Dr. H. H. Heine of the Munich Herbarium as a temporary Scientific Officer.

Towards the end of the year his colleagues at Kew were greatly shocked by the sudden death of Mr. R. A. H. Graham of the Colonial Office staff. He was a member of the team preparing the 'Flora of Tropical East Africa' and had been promoted to the rank of Senior Scientific Officer in May.

Mr. H. K. Airy Shaw made a welcome return in July to the Kew Staff under the aegis of the Bentham-Moxon Trustees. He has continued his taxonomic studies of Asiatic plants and has taken over the preparation of the new edition of Willis's 'Dictionary of Flowering Plants and Ferns'. Miss R. Angel was engaged by the Bentham-Moxon Trustees in July to assist in the preparation of a new edition of the Hand-lists of plants cultivated at Kew. Mr. W. R. Sykes also spent about ten weeks during the summer on this project under the auspices of the same Trustees.

Liason Officers

Mr. James H. Willis, a senior botanist from the Royal Botanic Gardens and National Herbarium of Victoria, Melbourne, is acting as botanical liaison officer for the Australian Government in Britain for the year ending April 1959. During the summer he visited herbaria, botanical gardens, botanical research establishments, university departments of botany, private and public gardens, both in the British Isles and on the Continent, in Belgium, Denmark, Holland, Norway and Sweden. He is spending the winter months completing the manuscript for a new flora of Victoria, embracing more than 3,000 indigenous and naturalized species of flowering plants.

Mr. W. Marais, of the National Herbarium, Pretoria, South Africa, is continuing to deal with routine enquiries from his home institution.

Expeditions and Excursions

Dr. R. W. G. Dennis returned from Venezuela in September, having spent three months collecting and recording *Fungi* in the Distrito Federal and the States of Miranda and Mérida, under the auspices of the Percy Sladen Trust. He was able also to make a valuable collection of over 300 flowering plants.

At the request of and with the collaboration of Mr. H. M. Heybroek of the Bosbouwproefstation, T.N.O., Baarn, Holland, Dr. R. Melville made an

excursion in July to Holland and Belgium to study the native elm populations. The nurseries of the Elm Disease Committee in the neighbourhood of Baarn were inspected and the results of the elm breeding work for which Mr. Heybroek is responsible were seen. Material of native elms was gathered in various parts of Holland and Belgium, duplicate collections of which were obtained for Leiden and Brussels.

Mr. F. N. Hepper arrived back at Kew in April, having made a fine large collection in the more remote parts of the highlands of the British Cameroons. He also visited parts of Nigeria, Ghana and Sierra Leone. This field experience will be of considerable value in connection with his work on the 'Flora of West Tropical Africa'.

Dr. N. K. B. Robson of the Colonial Office staff at Kew left in September on a plant-collecting expedition to Northern Rhodesia and Nyasaland, on behalf of the 'Flora Zambesiaca'.

Mr. D. A. Reid attended the British Mycological Society's spring foray and the joint field meeting of the British and French Mycological Societies at Reading, where he secured representative material of numerous interesting fungi, including a number of species new to the British flora.

Exhibitions and Lectures

An 'Open Day' attended by several hundred visitors, was held in the Herbarium on 10th May. All departments of the Gardens contributed to an extensive and much appreciated series of displays and demonstrations illustrating various aspects of Kew's contributions to the progress of botany. Later in the summer, on 5th July, members of the Lily Group of the Royal Horticultural Society visited the Herbarium to inspect exhibits of paintings, bulbs and fruits of species of *Lilium* and *Fritillaria*. Delegates to the International Union of Biological Sciences spent some time viewing and discussing selected items of the work of Kew displayed in the Herbarium, during their excursion to the Gardens on 13th July.

In the winter months, visiting botanists and members of the staff have kindly given a series of well-attended and much enjoyed lectures, illustrated by colour slides, on the plants and vegetation of Cyprus, Eastern and Western Australia, French Equatorial Africa, Ghana, Gough Island, Indonesia, Iran, Iraq, New Guinea, Northern Rhodesia and Tanganyika Territory, South Georgia, Turkey, and the West Indies.

Visitors

With fewer currency restrictions and improved travelling conditions generally, more overseas botanists are now able to study at Kew; their visits, together with those of British botanists, totalled 6,082, an increase of 435 over 1957. Regular visitors have included:—Dr. W. B. Turrill, engaged on the 'Botanical Magazine' and numerous botanical investigations; Dr. J. Hutchinson, continuing the preparation of his 'Genera Plantarum' and studies of the families of flowering plants; Miss S. Ross-Craig, preparing further illustrations for her 'Drawings of British Plants', parts XI and XII being published during the year; Dr. R. E. Holttum, engaged on the revision of Malaysian ferns for the 'Flora Malesiana'; Miss M. M. Whiting, who as in previous years has given generously of her time in rearranging the Indian collections.

Among the numerous overseas botanists who have spent mostly a week or more studying in the Herbarium may be mentioned: Mr. J. E. C. Aberdeen (Brisbane), Dr. C. D. Adams (Ghana), Dr. S. A. Ali (Karachi), Prof. A. L. Bernardi (Venezuela), Dr. G. Bocquet (Geneva), Mr. J. M. Bosser (Madagascar), Dr. A. Burkart and Mrs. N. Troncoso de Burkart (Argentina), Prof. A. L. Cabrera (Argentina), Dr. H. T. Clifford (Brisbane), Dr. R. Dahlgren (Lund), Prof. P. Duvigneaud (Brussels), Dr. P. J. Greenway (Nairobi), Dr. Ding Hou (Leiden), Dr. R. D. Hoogland (Canberra), Prof. P. F. Knowles (California), Dr. G. Lavrentiades (Salonika), Dr. J. Léonard (Brussels), Dr. J. Lorch (Jerusalem), Prof. F. A. McClure (Washington), Prof. E. Malinowski (Warsaw), Dr. E. Mendes (Lisbon), Dr. F. A. and Mrs. Mendonça (Lisbon), Dr. P. Mouterde (Beirut), Prof. C. H. Muller (California), Dr. E. Quisumbing (Manila), Rev. D. C. Saldanha (Bombay), Dr. H. Sleumer (Leiden), Mr. A. Sölch (Munich), Mme M. Spirlet-Marlier (Brussels), Mr. D. P. Stanfield (Nigeria), Dr. Z. U. Syed (Lahore, Punjab), Dr. A. Rocha de Torre (Lisbon), Dr. R. Weibel (Geneva) and Mr. J. S. Womersley (Lae, New Guinea).

Floras

Work on the Cyprus Flora has been somewhat interrupted by pressure of routine duties, but Mr. R. D. Meikle has now completed accounts of *Capparidaceae*, *Resedaceae* and part of *Cistaceae*, and hopes to progress at least as far as *Caryophyllaceae* during the relatively quiet winter season.

Mr. R. A. Blakelock has prepared accounts of several families for the 'Flora of Iraq', whilst contributions towards a preface for this work have been received from Mr. E. R. Guest. Several of the families already completed had been illustrated by Miss L. Ripley before her departure for South Africa in September; the work of illustrating the Flora has now been taken over by Miss M. Stones. A considerable amount of time has had to be spent on routine naming, and the assistance of Mr. M. J. S. Sands has been most valuable.

Although five out of the six Colonial Office posts for the 'Flora of Tropical East Africa' have been occupied during the year, only two of the botanists have had sufficient experience to be fully engaged on the preparation of the Flora; nevertheless, this has gained some momentum in 1958, during which year eight parts have been published, and four others, including the account of the *Mimosoïdeae*, have gone to press. It is hoped that these, the *Loganiaceae*, *Rosaceae* and *Droseraceae*, will be published early next year. The account of *Droseraceae* has been written by Mr. J. R. Laundon of the British Museum (Natural History). The editors have received the typescript of *Theaceae* which has been prepared by Dr. B. Verdcourt (East African Herbarium). Work continues on the *Papilionoïdeae*, on which subfamily Mr. J. B. Gillett has made good progress, whilst Mr. J. P. M. Brenan is working on the subfamily *Caesalpinioïdeae*, but much of Mr. E. Milne-Redhead's time has been occupied on editorial matters. Mr. J. R. Tennant is preparing the account of *Araliaceae* and Mr. C. Jeffrey is working on the *Ficoïdaceae*. Mr. R. A. H. Graham had done rather more than half of the *Capparidaceae* and it is hoped that the account of this family may be finished off next year. Several botanists outside Kew have continued to work on families for the 'Flora'.

The second part of the first volume of the revised 'Flora of West Tropical Africa' was published in March. Work is proceeding as quickly as possible on the first part of the second volume, whilst certain families which occur in the second part of this volume, including *Orchidaceae*, are already under revision. The Supplement covering the Fern and Fern Allies of West Africa is now in proof and should appear next year.

Dr. H. Wild, A.R.C.S., Senior Botanist to the Ministry of Agriculture, Federation of Rhodesia and Nyasaland, has continued to work throughout the year on the preparation of 'Flora Zambesiaca', the first part of which has already gone to press, Dr. N. K. B. Robson prepared the accounts of several families for this Flora before leaving in September for Northern Rhodesia and Nyasaland. Dr. E. Launert has frequently visited the Herbarium in connection with his work on other families for this Flora.

Kew Hand-lists

The Hand-lists of the plants grown at Kew have been out-of-print for some time, and in view of the numerous enquiries received about them, it has been decided that new editions shall be prepared. The overall direction of the work has been entrusted to Mr. J. R. Sealy, and Miss R. Angel has been engaged to check the references. The work started in July, and for some weeks during the summer Mr. W. R. Sykes was also engaged in the checking of the entries. The position at the end of the year was as follows:—Hand-list of Orchids; checked, scrutinized by Mr. V. S. Summerhayes, and ready for press-marking. Hand-list of Ferns and Fern Allies; checked, and ready for scrutiny by Mr. F. Ballard. Hand-list of Coniferae; checked, scrutinized by Dr. R. Melville, and now being typed. Hand-list of Trees and Shrubs; checked, and ready for typing, after which it will be circulated among the staff for further consideration. Hand-list of Herbaceous Plants; checking commenced.

'*Index Kewensis*'

Most of the year has been spent in reading the proofs and revises of Supplement XII (1951–55), which will be published in 1959 and will include about 20,500 entries. The compilation of Supplement XIII (1956–60) is going ahead satisfactorily.

Willis's 'Dictionary of Flowering Plants and Ferns'

The greater part of the work of extraction of additions for the proposed new edition of this Dictionary has now been completed, but the lengthy process of checking and final preparation has still to be carried out.

'*Botanical Magazine*'

The preparation of this publication at Kew continues under the editorship of Dr. W. B. Turrill, and Parts I and II of volume 172 were published on 1st April and 1st October respectively.

Europe, SW. Asia, N. Africa

A considerable amount of the section's time continues to be taken up with a wide variety, and an undiminished number, of enquiries from the general public, and from agricultural and horticultural advisory institutions. Every effort has been made to keep pace with an increasing influx of Oriental

and European collections, to ensure that these are mounted and laid into the herbarium within a reasonable period from their arrival. Considerable progress has also been made with the mounting and laying in of smaller and less important collections, some of which have been in store for many years. It is hoped that all the European and Oriental material will soon be in the herbarium cupboards and readily available for examination by staff and visitors.

Extensive collections have been presented by the National Herbarium, Iraq. Further Iraq material has also been received from Prof. R. W. Haines, Mr. O. Polunin, Hunting Technical Services (Dr. M. E. D. Poore), and from the University Herbarium, Faculty of Science, Baghdad (Prof. N. Polunin and Dr. A. D. Q. Agnew). Valuable collections have also been received from Dr. P. H. Davis (an exceptionally fine series of 6,205 Turkish plants), Mr. P. Bevington Smith (Turkey), Mr. E. S. Brown (Turkey), Mr. F. Merton (Persia), Mr. E. C. Casey (925 sheets of Cyprus plants), Mr. T. D. Maitland (Lebanon), Major C. H. L. Pickering (Atlantic Islands), Mr. J. S. Womersley (Northern and Central Europe), Capt. J. Waring and Mrs. K. Ogborn (Aden), Mr. T. Titchen (Sardinia), Mr. N. Y. Sandwith (270 Spanish plants, chiefly from the provinces of Navarra and Soria), Mr. H. M. Burkill (a very nice set of British plants), Mr. F. M. Day (his herbarium of 1,036 sheets of British plants), Mr. J. E. Lousley (critical native and alien members of the British flora) and Mr. J. E. Woodhead (a valuable set of British *Rubi* from the collection of the late Mr. W. Watson). The Bentham-Moxon Trustees presented a set of Dr. K. H. Rechinger's Persian plants (480 sheets).

National Dianthus Collection

Seeds and plants for this Collection have been received from the following donors:—Dr. al-Rawi (Iraq), Mr. J. Cowan (Pyrenees), Dr. P. H. Davis and Mr. I. Hedge (Turkey), Mr. N. Easterbrook (Yugoslavia), Mr. A. Gray (S. Spain), Mrs. S. Papageorgiou (Greece), Mr. N. Y. Sandwith (N. Spain), and Miss A. V. Webster (Spain). In addition plants have been raised from seed received in exchange from European Botanic Gardens. Work has continued on the growing and pressing of hybrids produced by controlled pollination, and a successful cross between a European and a South African species has flowered. Gathering of seed from stock plants after selfing was made difficult by the wet summer.

In the Herbarium the study of Iberian and Pyrenean species of *Dianthus* has been continued. An account of the genus is being prepared for the 'Flora Zambesiaca'.

Northern Asia, China, Japan, N. India

Curatorial and routine work has again absorbed a great deal of time, much of it spent in naming cultivated plants, assisting visitors, and on enquiries from botanical institutions, mostly Indian and American.

A little progress was made with the checking of the material from the Hong Kong and Greatrex herbaria.

Tropical Asia

A record total of almost 11,000 specimens was received during the year. The largest contribution consisted of nearly 5,000 duplicates by the Herbarium Bogoriense. A set of 1,800 specimens collected by L. J. Brass on the 5th Archbold Expedition to New Guinea was presented by the Bentham-Moxon Trustees. Large consignments have been received for the first time from the Brunei Forestry Department for naming. Other important Borneo collections were received from Kuching and Sandakan. Specimens sent from Singapore included collections made by Mr. J. Sinclair on Mt. Kinabalu in N. Borneo. Sets of duplicates were presented by the Rijksherbarium, Leiden; National Herbarium, Manila; Department of Forests, Lae. Rev. N. E. G. Cruttwell again sent specimens collected by him in New Guinea.

Of the above material, part has already been mounted and laid into the Herbarium, the rest has all been sorted into families which are readily available if required at short notice. The specimens mounted and incorporated in the Herbarium during the year reached a total of over 9,800 sheets.

The revision of Malaysian *Menispermaceae* has been continued and an account of the genus *Cyclea* prepared for publication.

Australasia

Two collections of plants from the Maralinga area, presented by Dr. H. J. M. Bowen and Mr. T. W. Shilling, have added considerably to our knowledge of the flora of this part of Central Australia. Mr. G. Chippendale of the Animal Industry Division, Alice Springs, presented 80 herbarium specimens of northern Australian plants and seeds of several *Ptilotus* and rare *Acacia* species for cultivation, the latter including members of the interesting section *Brunioïdeae* bearing verticillate phyllodes. The mutually valuable collaboration with Australian and New Zealand herbaria in the exchange of information and specimens has continued. Specimens contributed by Australian National Herbaria were received from Sydney, Brisbane and Adelaide. Small collections from Christmas Island were received from Mr. A. L. Hill and Mr. J. P. Griggs. Mr. E. Lawrence, Director of Agriculture, Tonga, has presented 45 specimens from Tonga as a first consignment in connection with a study of the flora of that Island.

The Director of the Forestry & Timber Bureau, Canberra, has generously presented a copy of the 'Card sorting key for the identification of Eucalypts' by N. Hall and R. D. Johnson. This has proved to be especially useful in the determination of extra Australian *Eucalyptus* specimens, which frequently lack some of the critical parts.

Mrs. M. C. Russell of Como, Western Australia, submitted a sundew for determination which proved to be *Drosera zonaria* Planch., previously known only from the type specimen. It was collected close to Helena, James Drummond's former homestead where he collected it over 100 years ago.

Tropical Africa

1958 has been another year of great activity in the Section. Over 17,000 specimens have been received and a similar number mounted during the

year, whilst 22,000 have been laid out for mounting. Over 10,000 duplicate specimens from tropical Africa have been distributed to foreign herbaria and about 20,000 determinations have been made of which some 8,700 have been sent to collectors.

Some of the more important collections received were made by the following:—Cambridge University Expedition to West Africa (Sierra Leone); Dr. C. D. Adams, Mr. R. Rose Innes (Ghana); members of the staff of the Federal Department of Forest Research, Ibadan (Nigeria and the British Cameroons); Cambridge University Expedition to French Equatorial Africa (Gaboon); Dr. G. Troupin (Belgian Congo and Ruanda-Urundi); Dr. H. F. Mooney (Ethiopia); Mr. P. R. O. Bally (Somaliland Protectorate); Dr. E. Lind (Uganda); Mr. A. V. Bogdan, Dr. P. J. Greenway, Mr. S. P. Rawlins, Mrs. D. R. Tweedie, Dr. B. Verdcourt (Kenya); Mrs. H. G. Faulkner, Mr. R. E. S. Tanner (Tanganyika); Mr. G. Jackson (Nyasaland); Mr. D. B. Fanshawe, Mr. R. M. Lawton, Mr. E. A. Robinson, Mrs. J. M. Wright (Northern Rhodesia); Major O. B. Miller (Southern Rhodesia); Dr. A. de F. Gomes e Sousa (Portuguese East Africa). One of the most valuable collections received during the year was that made by Mr. F. N. Hepper in the northern highlands of the British Cameroons including the Vogel Peak area. This collection has added many species to the area covered by the 'Flora of West Tropical Africa'.

Further very excellent collections of *Aloë* species, together with photographs and notes, have been contributed by Dr. G. W. Reynolds. A fine collection of certain species of Yams from Southern Rhodesia has been given to Kew by Miss A. P. Wilson, who has been specializing on these species with a view to their economic use. As usual, many excellent collections from wide areas in eastern Africa have been received from the East African Herbarium, whilst a large number of specimens, mainly from Southern Rhodesia, has been donated by the Government Herbarium, Salisbury. The herbarium of the Imperial Forestry Institute at Oxford has generously presented many named duplicates of tropical African plants to Kew during the year. Last, but by no means least, mention should be made of the large numbers of duplicate specimens from the Belgian Congo, most kindly given to Kew by Prof. Dr. W. Robyns, Director of the Jardin Botanique de l'Etat, Brussels.

South Africa

Most of the very numerous routine enquiries from the National Herbarium, Pretoria, have been attended to by the South African liaison officer, Mr. Marais, who has also spent considerable time studying *Gentianaceae* and *Maytenus* (*Celastraceae*). An enumeration of the South African species of the latter has been prepared for publication in 'Bothalia'. Queries have ranged through *Plumbaginaceae*, *Apocynaceae*, *Acanthaceae*, *Malvaceae*, *Liliaceae* and *Asclepiadaceae*, all families in active preparation for publication in the forthcoming 'Flora of Southern Africa'.

As usual, gifts of specimens from Pretoria have been numerous and valuable; special mention must be made of the excellent sets of specimens collected by Mr. B. de Winter and his colleagues in South West Africa, Ovamboland, Okavango Territory and the Kaokoveld. These have enor-

mously enriched our collections from areas hitherto practically unknown botanically.

Large numbers of specimens on loan have passed backwards and forwards between South Africa and Kew, in connection with both the " Flora of Southern Africa' and the 'Flora Zambesiaca'.

Professor R. S. Adamson spent some time studying Kew collections of *Aizoaceae* and specimens received on loan from other institutions.

America

The largest and most useful collections received for identification were those of Mrs. Ruth Tweedie, in Patagonia (Territory of Santa Cruz), and Dr. R. W. G. Dennis in Venezuela (especially on the Andes of Mérida, where he gathered rare and little known plants including a number of additions to the Herbarium). The study of these collections has been nearly completed. Small consignments of specimens for identification were received from time to time from the Imperial College of Tropical Agriculture (Trinidad) and from the Departments of Agriculture in Bermuda and at Georgetown, British Guiana. Among the more important accessions should be mentioned the set of the collection of Mr. P. J. Grubb and his companions, members of the Cambridge Expedition to Colombia, the fine series of Ekman duplicates from Cuba and Hispaniola, a large collection of Alaskan plants cited in Professor Hultén's 'Flora of Alaska and Yukon', and the set of Prof. E. Asplund's plants from the Andes, the last three presented by the Stockholm Herbarium; and further most valuable consignments of specimens collected by Dr. Bassett Maguire and his friends in southern Venezuela, presented by the New York Botanical Garden.

Much time has been spent in the study of *Bignoniaceae*, and the botanist in charge has named large series of specimens from the Paris and Stockholm Herbaria; the United States National Hebarium, and the Herbaria of the New York Botanical Garden and the University of Michigan; the Instituto Agronômico do Norte (Belém) and the Instituto Nacional de Pesquisas da Amazônia (Manáus); and smaller consignments sent by a number of other correspondents in South America.

Orchidaceae

Once again the determination of living plants constituted an important part of the routine work; these came mostly from the Gardens although many were received from outside growers. Determinations were also made of dried specimens from all parts of the world, but mainly from Africa. Miscellaneous queries in connection with the taxonomy or nomenclature of various species and genera were also dealt with.

Research was continued on African orchids in connection with the Floras of West and East Africa now being prepared. Accounts of the genus *Platycoryne* and of the mainland species of *Angraecum* were published during the year, while work on the very critical genus *Cyrtorchis* is now nearly completed.

Cyperaceae

Several collections of tropical African *Cyperaceae* have been received during the past year but there was some slowing down in their naming,

mainly due to the ill-health of the botanist concerned. On this account also there was somewhat less prepared for the 'Flora of Tropical East Africa', but the difficult genus *Kyllinga* was tackled during the year.

Gramineae

Throughout the greater part of the year the Section has been understaffed, and the routine work of naming and adding to the Herbarium has become much in arrears. During the last three months of the year the botanist's time has been wholly devoted to naming, and nearly all the West African collections, including those of Mr. F. C. Deighton, Mr. H. D. Jordon and Mr. T. Jones, from Sierra Leone; Dr. C. D. Adams from Ghana; Mr. F. N. Hepper, Mr. J. H. Hinds and the Forest Herbarium, Ibadan, from Nigeria; and M. J. G. Adam and Mr. J. T. Davey, from French West African territory, have been added to the Herbarium. This has been in preparation for the revision of the family for the 'Flora of West Tropical Africa', which it is planned to begin next year.

Vascular Cryptogams

In addition to routine naming and reporting, work on the 'Flora of Tropical East Africa' has progressed during the year and a great deal of borrowed material has been worked through. The compilation of the supplement to the 'Index Filicum' has also continued.

The only large collection of ferns to be received consisted of 850 Malaysian duplicates from Herbarium Bogoriense. This valuable addition to our collections has been named by Dr. R. E. Holttum and will be incorporated as soon as possible.

Bryophyta

During the year the complete liverwort collection has been rehoused in new cabinets, and the opportunity was taken to split the aggregate genus *Lejeunea* into the 60 or so smaller genera now recognized. Dixon's herbarium of British mosses has been re-arranged according to the check-list of Richards and Wallace (1951). Amongst the specimens received during the year have been those donated by Dr. and Mrs. D. A. Q. Agnew (Iraq), Dr. H. J. M. Bowen (Australia), Mr. T. T. Elkington (Newfoundland) and Mr. C. Jeffrey and Dr. E. W. Jones (Africa).

Dr. Dalby attended two meetings of the British Bryological Society, and is assembling duplicates of British material for exchange. The first exchange has been completed with the despatch of 108 gatherings to Hiroshima. Time has again been given to the study of *Sphagnum*, and also to epiphytes on Cacao from Nigeria and São Thomé.

Algae

Taxonomic work has been concerned mainly with miscellaneous identifications; there has also been an increasing demand for information relating to historic specimens in the Kew collection.

About 400 specimens of marine *Algae* from Ghana have been rebottled and transferred to the basement to form part of the general spirit collection. The final parts of the 'Phycotheca Boreali-Americana' (Fascicles XXXVIII

to XLVI) have been mounted and incorporated in the herbarium. The first set of a collection of British seaweeds has been sent out on an exchange basis.

Specimens of *Asparagopsis armata* Harv., a recently introduced species which has been recorded *in situ* on only three previous occasions, were obtained during a visit to Cornwall in July. These are the first European specimens to reach Kew.

Gifts included 60 specimens from the coast of East Africa received through Dr. P. J. Greenway, and a valuable set of *Codium* species, including 9 new taxa, donated by Dr. P. Silva, University of Illinois.

Fungi and Lichens

Acquisitions during the year included an important set of fungi from Pernambuco presented by Dr. C. Batista, an interesting collection from San Salvador presented by Dr. W. Lötschert of Frankfurt am Main, approximately 1,300 numbers of Venezuelan fungi and lichen presented by the Percy Sladen Trustees, and the James Needham fungus herbarium presented by the Hebden Bridge Literary and Scientific Society.

Dr. J. Motyka of Lublin has revised our collections of *Alectoria* and Dr. C. W. Dodge has revised the African material of *Parmelia*. Brief visits were paid to the herbarium by Dr. E. Frey, to revise *Umbilicariaceae*, and by Mr. J. H. Tallis to revise British *Usneae*.

Spirit Collection

The record number of 1,480 gatherings was added during the year, the total number of bottles now standing at nearly 15,600. As in previous years the *Orchidaceae* provided the largest number (nearly 450); other families to which substantial additions were made were *Liliaceae*, *Cucurbitaceae*, *Rubiaceae* and *Asclepiadaceae*. Spacing out and re-arranging of some parts of the collections has been continued as time has permitted.

Nomenclature

External queries of a general nature have been fewer than of recent years—a fortunate occurrence, since much time has been spent upon preparations for the Nomenclature Section of the International Congress to be held in Montreal in 1959. This has included organization of three meetings of botanists representing Kew, British Museum, Oxford, Cambridge and Edinburgh, to deal with questions relating to general improvement of the International Code, and to produce a common policy in regard to the vexed question of nomenclatural stability. Some results of these meetings are embodied in proposals 151–201, published in Taxon **7**, 257–270.

A great deal of work has been accomplished in the field of family nomenclature, which has been largely neglected until the present time.

Gardens Herbarium

The herbarium of herbaceous plants formerly housed in the Herbaceous Department has been amalgamated with the material of woody and tender plants already housed in Descanso House, and the whole put in order to form a reference collection for the use of the Curator's staff.

Herbarium Material of Cultivated Plants

It has been decided that specimens shall be collected from plants grown in the Gardens under collectors' field-numbers and also from plants of special interest, and to distribute the duplicates to other herbaria. A start was made during the year in the Arboretum and a total of thirty numbers obtained.

The Library

The library continues to increase at a rapid rate. Over one thousand new items were added during 1958 (excluding parts of periodicals), of which some 140 were purchased. The rest were presented by many individuals and institutions at home and abroad, or sent by publishers for review. The library now contains over 55,000 bound volumes and over 80,000 reprints and pamphlets.

Among the important works acquired were included three volumes of the 'Flora Republicii Populare Române' edited by Professor T. Săvulescu, another volume of the 'Flora de la Real Expedición Botánica del Nuevo Reino de Granada' for which we are indebted to the Bentham Moxon Trustees, the 'Orchids of Australia' part 4, presented by the Trustees of the Stapf Memorial Fund, the Flora of Ukraine vol. 8, the Flora of Armenia vol. 3, 'Genera et Species Plantarum Argentinarum' vol. 5, the 'Identification of living Gymnosperms on the Basis of Xylotomy' by P. Greguss, 'Flowers drawn from Nature' by G. van Spaendonck, and 'The Sloane Herbarium' edited by J. E. Dandy.

New periodicals received included 'The Lichenologist', the 'New Zealand Journal of Agricultural Research', and the 'New Zealand Journal of Science'.

A noteworthy addition to the collection of drawings acquired during the year was the extensive series of 2,184 finely executed water colours of Phanerogams and Fungi by the late F. Clarke, generously presented by Mrs. Clarke. Miss E. Armitage very kindly gave the paintings of species of *Iris* made by her sister, Miss Cecilia Armitage, whilst an extensive series of very attractive water colours of British and Swiss plants painted by Ruth Hayton was kindly presented by her sister Miss E. I. Hayton.

During the year 600 volumes were bound or rebound, and 100 small and 50 large box files were acquired to space out and file the growing collection of reprints.

Once again we are indebted to the Ordnance Survey and the War Office for continuing to supplement our collection by sending us copies of their maps as issued.

Photocopying was carried out most efficiently for us by the Photographic Section of the Ministry of Agriculture at Whitehall Place; we have also been enabled to supply numerous microfilms and photostats to enquirers, through the kindness of the Commonwealth Mycological Institute.

Many requests for the loan of books were received during 1958 from other Government establishments, research institutions and universities in the British Isles, and towards the end of the year a few were also received for the loan of books on *Diatomaceae* from the Adams Collection.

Department of Economic Botany

The Museums

With the decision to close one of the two timber museums (No. III Museum) in order to convert the building to an Orangery a good deal of attention had to be paid to the disposal or storage of the timber specimens. Some of these were very large and in fact striking specimens of their kind, having been specially selected in their countries of origin, largely for the International Exhibition of 1862.

The Totem Pole, received from British Colombia in 1898, which stood at the west end of the building was accepted for the British Museum where it is now exhibited. It is regarded as a particularly fine specimen and in an unusually good state of preservation. It had been cut from a Western Red Cedar log (*Thuja plicata* D. Don.) and was nearly four feet wide at the base. The British Museum also received a number of other specimens from the building, including an interesting West African canoe from Sierra Leone.

The Horniman Museum in south east London also received a number of specimens from the building. These were mainly specimens of special ethnographical interest.

A large number of timber or plank specimens was despatched to the Forest Products Research Laboratory, Princes Risborough, having previously been selected by representatives from the Laboratory. The spectacular block of Douglas Fir wood weighing about five tons was removed, not without some difficulty, to a timber yard to be cut to specified dimensions and then used in special testing work at the Laboratory. Some other very large specimens of Douglas Fir wood were similarly used.

Most of the specimens previously in the galleries of No. III Museum, mainly 3–4 feet in length, are to remain for the time being in the Annexe of the building as a reference collection. The reference collection of Conifer material is also to remain in the Annexe where it will be readily available at any time.

By modifying and reducing the collection of home grown or British timbers in Cambridge Cottage, or No. IV Museum, it has been possible to display many of the plank size specimens (6–7 feet in length) from No. III Museum in Cambridge Cottage, which will in future be known as and constitute the 'Wood Museum'. In selecting specimens for display it was decided to concentrate on commercial woods, i.e. woods which are actually imported to this country or used in the wood working industries. These specimens are mainly arranged according to countries of origin with some emphasis on the Commonwealth countries. This arrangement is the one likely to be preferred by and be most helpful to visitors to the museum interested in wood, and particularly carpentry or wood-work instructors with their classes of boys, who are frequent visitors. With the new labels now in preparation the properties of each wood are briefly described. It has been possible to exhibit about two hundred and twenty different commercial woods in the space available. It is hoped to substantially improve upon the collection as other plank specimens become available.

It is interesting to reflect that with the closing of No. III Museum as a museum of timbers from overseas the building has functioned as a museum for nearly one hundred years, for it was in 1863 that it was opened as a timber or wood museum. In the Kew Report for that year it is stated 'The old Orangery, so long condemned as a house for purposes of cultivation, and at last emptied by the transference of its contents to the Temperate House, is now chiefly occupied with the magnificent collection of Timbers, Cabinet and Furniture Woods, from the Great Exhibition of 1862 . . . . . '

The routine work of the Department during the year followed very much the same pattern as in recent years. Matters were rendered a little more difficult through the absence of one member of the staff (Mr. S. G. Harrison) on special duty in British Guiana in connection with the Colonial Office. This absence dated from February, 1958.

The Distribution of Economic Plants

The distribution of useful plants was continued actively during the year under review, planting-material of cacao and of bananas being in especial demand. Budwood of the Samoan cacao 'Lafi 7' was sent to Florida for the United States Department of Agriculture, and rooted plants of the same clone went to Wageningen for later forwarding to Netherlands New Guinea. Another consignment to make a long journey consisted of plants of two selections from Grenada, which were grown in the Quarantine House and shipped in a wardian case to Fiji, where efforts are being made to develop a new cacao industry. The collection of cacao in the Quarantine House was augmented by three clones resistant to witches-broom, SCA 6 and 12, and IMC 67, which came from the Imperial College of Tropical Agriculture, Trinidad.

A large collection of banana plants, chiefly diploids from New Guinea and East Africa, was forwarded to Trinidad for the banana collection at the Imperial College. Commercial varieties from the Quarantine House, including 'Gros Michel', 'Lacatan' and 'Giant Cavendish', were sent in the other direction, some to Rhodesia, others to Kenya and to the Cameroons. To the plants in quarantine were added two seedlings raised in Jamaica, a variety from the Cameroons, and several clones from the South Pacific and from a nursery in California.

Three plants with economic possibilities were sent to East Africa: guarana, *Paullinia cupana* H.B. & K., a plant whose seeds are used in Brazil to make a beverage; *Sansevieria stuckyi* Hook. f. for trial as a source of fibre; and the drug-plant *Rauwolfia serpentina* Benth., which was sent to British Guiana as well as to Kenya.

An exhibit illustrating the work of plant quarantine and introduction was set up for the two Open Days, and again for the visit of the International Union of Biological Sciences.

Study of the *Raphia* species of West Africa was continued by Mr. T. A. Russell, progress being assisted by some material sent by Mr. P. Tuley, Agricultural Botanist in E. Nigeria. Despite this addition, our collection of *Raphia* at Kew remains far from complete, and additional gatherings and notes are needed to clear our understanding of these useful palms.

The Jodrell Laboratory

Research

The most notable event has been the completion, after about 10 years work, of the manuscript of a book on the anatomy of the *Gramineae*. It has been estimated that the book will consist of some 800 pages. It contains original descriptions of the leaf structure of 413 species belonging to 206 genera. The structure of the culm and root of many genera and species is also included. In addition the literature relating to all aspects of grass anatomy, and especially to leaf structure, has been summarized, thus bringing the total number of genera that have been treated up to 345. Brief taxonomic notes on nearly all of these genera, in the light of their leaf anatomy, are given. The book also contains sections that deal with the morphology of the grass plant, the diagnostic microscopical characters, a discussion on grass taxonomy in the light of anatomy, and the selection and preparation of material for microscopical examination. There are also tables listing the genera and species in which certain diagnostic characters are to be seen, and a bibliography which is believed to be reasonably complete. Thanks to the Bentham-Moxon Trustees it has been possible to employ Miss M. Long to type the manuscript and to give clerical assistance in many different ways. Without this assistance the book would still be far from complete. It is expected that the Clarendon Press will publish the book before the end of 1959, and that it will constitute the first volume of 'Anatomy of the Monocotyledons'.

Another notable event connected with 'Anatomy of the Monocotyledons' has been the completion, by Dr. P. B. Tomlinson, of his manuscript and illustrations for a volume on the *Palmae*. This has yet to be typed and made ready for the Press, and is expected to constitute a book of 450–500 pages. The work leading to the preparation of this book has been completed mostly at Singapore and Achimota rather than at Kew, but it was undertaken as part of the programme initiated at the Jodrell Laboratory. Dr. Tomlinson was granted a term's special leave of absence from University College of Ghana to enable him to complete the manuscript in England.

Dr. M. Y. Stant has continued her work on the effects of irradiation with light from mercury vapour lamps on the growth of tropical plants, and on the influence of gibberellic acid on plant growth. In the experiments with electric light, which were conducted during the first 4 months of the year, a comparison was made between plants irradiated every day from 8.0 a.m. to 8.0 p.m. with those of a control set which were exposed to the normal daylight alone. A record of the temperature, humidity and light intensity was kept, and the progress of the plants was recorded photographically and by taking measurements. Conspicuous differences, and considerable improvements in growth, were induced by the irradiation, and these are now being analysed and worked out in quantitative terms. Exhibits to illustrate the irradiation experiments were staged by Dr. Stant both in the Herbarium and at the Linnean Society.

In the gibberellic acid experiments, the treated plants were sprayed once a week with an aqueous solution containing 100 parts per million of the acid. Quantitative differences in the size and form of the plants were produced and a photographic record was kept. Material from treated and

control plants was fixed with a view to studying the histological changes induced by the gibberellic acid. Dr. Stant gave an account of these investigations at a symposium on experimental morphology arranged by the Linnean Society in December.

Routine Work

The routine work has continued at about the same level as in recent years and reports have been sent in response to about 120 enquiries. Most of the work has consisted in establishing the botanical identity of miscellaneous vegetable material from its microscopical structure, and a few enquiries of a more physiological nature have also been answered. The identification of plant fragments in rabbit pellets has taken up a considerable amount of time. These investigations were undertaken in response to a request from the Nature Conservancy, and formed part of a study of the feeding habits of rabbits undertaken by Mr. R. M. Lockley in Pembrokeshire. The task of identification was made easier because Mr. Lockley was able to provide lists of the species of plants to which the rabbits were known to have had access. The investigation indicated that the rabbits are highly selective in their feeding habits. A similar investigation of fox droppings, undertaken on behalf of Mr. R. A. Lever of the Ministry of Agriculture, Fisheries and Food, showed that vegetable material eaten by foxes is very miscellaneous, and is probably consumed incidentally with a mainly carnivorous diet. Plant fragments from fox droppings proved to be more decomposed than those from rabbit pellets and therefore more difficult to identify.

Some of the more unusual items received for identification were as follows. So-called 'roots', from a swamp in Ethiopia, used for making flour, were the tubers of a species of *Nymphaea*; 'zonca' fibre from Peru was found to consist of the floss from a cactus of the *Pilocereus* type; 'roots' growing through the damp floor of a house were identified as the rhizomorphs of the fungus *Armillaria mellea*; a root from Switzerland, used to prepare a remedy for sore throats, turned out to be that of *Pimpinella saxifraga*; a substitute for Indian Rhubarb was identified as the root of *Bergenia ligulata*. It was also established that Swedenborg was buried in a coffin made of the wood of Larch or Spruce and that a fragment of charred leaf taken from a commercial packet of tea was that of *Diospyros tomentosa*, or of a closely related species, probably used as a cigarette wrapper.

Additions to the Slide Collection and Material presented to the Laboratory for Research Purposes

During the year Mr. F. Richardson and Miss D. M. Catling have, between them, added some 30 microscope-slides of timbers and 280 slides of Monocotyledons to the reference collection. The monocotyledonous slides consist of representatives of the *Graminaeae*, *Cyperaceae*, *Thurniaceae*, *Hypoxidaceae*, *Taccaceae* and *Xanthorrhoeaceae*.

Dr. M. R. Levyns presented a number of preserved specimens of South African Monocotyledons which she had collected specially for the anatomical investigations in progress at the Laboratory. Dr. Bassett Maguire of the New York Botanical Garden also sent a most valuable collection of South American Monocotyledons for anatomical investigation. Wood samples

received for the preparation of microscope slides include a large collection from the Forest Herbarium Ibadan and another consignment from Nigeria collected by the Cambridge botanical expedition 1947–48. An unusual donation was the stem of a woody species of *Valeriana* collected on the Colombian Andes by Mr. P. J. Grubb of the Botany School, Cambridge.

Visitors

Miss C. Western of the Institute of Archaeology visited the laboratory on a number of occasions seeking advice concerning the identification of archeological charcoals. Mr. J. Ghartak from Sudranath College, Calcutta spent a short time working on the cytology of ferns. Mr. Esteben Nīguez Cabezas, from Chile, worked for several months on the leaf anatomy of Chilean grasses, whilst registered as an M.Sc. student at University College, London. This work is still in progress. Dr. P. B. Tomlinson visited the laboratory on a number of occasions to discuss the progress of his work on the anatomy of Palms.

The Gardens

Periods of frost and snow were experienced in January and February, followed by a dry period in March and April. From thence onwards heavy rains were experienced, particularly in June and September when over 4 inches of rain were recorded. The wet season, though making work difficult, suited plant development and the collections out of doors derived great benefit from the second consecutive wet summer. During the year the attendance totalled 946,499, proof of the attraction which the Gardens hold for the general public.

Alpine and Herbaceous Department

Further reconstruction and development of the Rock Garden was continued during the year. The NW. corner facing the Sherman Hoyt was cleared of trees and shrubs, and several hundred cubic yards of soil brought in to give added height to the outcrops which were to be constructed. In the course of rebuilding several deep gullies were formed which in addition to giving pleasing views into the lower part of the Rock Garden also provided good growing conditions for many *Ericaceae* and other peat-loving plants. Immediately construction and resoiling were completed a series of spray-lines for use in dry seasons was installed. Replanting was not completed until well into the summer, but the wet season enabled the plants to make considerable growth by autumn. Early spring and summer presented many pleasing features and in particular the large flowering groups of *Cytisus beanii*, *C. kewensis*, *Phlox adsurgens*, *Cyananthus* spp. *Gentiana freyniana*, *Penstemon* spp. *Pachylophus caespitosa*, and in autumn *Polygonum affine* 'Darjeeling Red' were outstanding.

Meconopsis and Primulas made a pleasing feature among the Rhododendrons at the south end of the Rock Garden. Several species collected in Nepal in 1954 flowered for the first time, and in common with others the flowering period was much prolonged by the wet conditions. On the mound near Cumberland Gate, several large beds were constructed for the cultivation of Primulas, Meconopsis and Liliums. *Lilium maritimum*, a dwarf and

charming lily native of the sphagnum bogs of the Pacific coast of N. America, deserves special mention, whilst *Lilium speciosum* and its varieties also flowered well. Others of interest were *Lilium lankongense* a white Martagon type from China, *Lilium pardalinum giganteum*, and the rather uncommon species *Lilium tsingtauense*.

The Iris Garden proved a wonderful attraction as the flowering period was prolonged by the cool weather conditions. The addition of new American varieties helped to widen the range of colour and the display was possibly the finest for many years. The bed devoted to Iris species has proved very successful in that the general public display great interest in the wide range of types to be seen.

The Alpine House is always a great source of attraction and the display in the early months of the year proved particularly colourful. Amongst the more uncommon plants which flowered well were *Chrysanthemum catananche*, and *Ranunculus calandrinioïdes*, both natives of Morocco. *Verbascum dumulosum*, a very handsome species from Asia Minor, and *Tecophilaea cyanocrocus*, commonly called the Chilean blue crocus, were of special interest. Several species of *Calochortus* which had not been grown at Kew previously, and plants such as *Arum creticum* and *Draba mollissima*, all contributed to the pleasing display.

In wet seasons, there has been some difficulty in the past in the propagation of some of the alpine plants, and during the year a soil heating cable was installed in the frames in the propagating house (25B). The installation proved a great success, and increased considerably the percentage of cuttings successfully rooted.

Numerous consignments of seeds, bulbs and plant material were received during the year and special mention can be made of the following :— Prof. T. Reichsten of Basle sent in a collection of seeds of plants native of the Swiss Alps, T. Rokujo of Japan, a number of rare and unusual species, the Hon. Robert James, of Richmond, Yorks., F. Skinner of Manitoba, and Sir Eric Savill of Windsor Great Park, all contributed species of *Lilium*. Prof. D. A. Webb of Dublin sent a number of species of *Saxifraga*, Clyde Robins interesting and unusual Californian plants, Oleg V. Polunin bulbs and plants collected in Kurdistan and Iraq, Mrs. Ruth Tweedie presented a large and varied consignment of seeds which she had collected on an expedition to Patagonia and the Argentine, Mr. H. J. Randall was particularly generous in giving a fine collection of new *Iris* varieties, many of which have just been released by the American growers. All these presentations have helped to augment the very large intake of both seeds and plants from other well known Botanic Gardens both in Great Britain and abroad.

At the Royal Horticultural Society's shows *Scutellaria indica* var. *japonica* received an Award of Merit, and *Saxifraga cortusifolia* var. *fortunei* received a First Class Certificate. Material of the following plants supplied from the department were figured in the Botanical Magazine:—*Polemonium foliosissimum* (t. 310), *Lychnis* × *haagena* (t. 314), *Camassia cusickii* (t. 319), *Macleaya kewensis* (t. 321), and *Silene integripetala* (t. 328).

Tropical Department

Tropical Pits

The routine work of propagating and growing on both Tropical and Economic crops were continued throughout the year. 190 consignments of plant material were packed and despatched to Botanic Gardens and other Scientific Institutions at home and overseas. Several large and interesting collections of plants and seeds were received from the Herbarium, S. G. Harrison in British Guiana, Dr. J. F. Rock, Hawaii, W. J. de Leon, U.S.A., Fairchild Tropical Gardens, Florida, U.S. Department of Agriculture, Washington, Department of Agriculture, Bermuda. Seed germination was good and many of the plants successfully raised should prove valuable additions to the living collections. Cuttings and seeds of *Citrus* varieties were received from Miss M. S. Campbell from the south of France, and 12 large plants of *Citrus* from the Johannesburg City Council. R. B. Cook collected cuttings of South African Heaths, which when rooted will prove a great asset. The rhizomes of *Arundinaria*, *Bambusa* and *Phyllostachys* spp., from the U.S. Dept. of Agriculture have been successfully established. Cuttings of *Rauwolfia serpentina* rooted early in the year were despatched to the Departments of Agriculture in British Guiana, Nigeria and Kenya.

In the Melon Yard three automatic oil-fired boilers were installed in the stokehole near the Iron Room, and these should help to improve the growing conditions in the Houses.

Quarantine House

Propagation of both Cocoa and Bananas was continued whilst a number of cuttings of *Manihot leptophylla* were successfully rooted, the latter plants growing freely, and flowered and set seed during the season. For further information see under 'The Distribution of Economic Plants' on p. 15.

Ferneries

Many new species of ferns were received during the year. These totalled over one hundred species some of which have not been represented at Kew for many years and several are entirely new. The chief consignments came from Professor R. E. Holttum, Malaya, Dr. T. G. Walker, Jamaica, and W. M. Campbell, Dominica. Dr. J. F. Rock sent spores of Hawaiian ferns.

Several rare ferns have been raised from spores including *Cyathea excavata* and *Sadleria polystichoïdes*, while in addition great success has been obtained with the filmy ferns and many young plants are now established in pots. Valuable fern material was sent to Professor I. Manton, Leeds University, for cytological examination. Some 670 packets of fern spores were distributed to Botanic Gardens at home and overseas.

Aroid House

The Ministry of Works completed the reglazing of the roof of this house, and repainted the exterior. The additional light has greatly improved the growing conditions and quite a number of the exotic aroids flowered freely. *Philodendron giganteum* was figured for the Botanical Magazine.

Succulent House

Despite the poor summer cacti and succulent plants made excellent growth, and due no doubt to the additional light and better growing conditions in this new house, many flowered which had previously failed to do so. Noteworthy plants which flowered were *Agave bouchei*, *Cereus argentinensis*, *Ceropegia sandersonii*, *Pereskia aculeata*, and *Selenicereus donklaarii*. Many valuable additions were made to the collections, the chief donors being H. Hall, Kirstenbosch Botanic Garden, Mrs. V. Higgins, Croydon, P. R. O. Balley, Nairobi, and Dr. P. J. Greenway, Nairobi. Despite constant patrolling nofewer than 48 items were stolen by the public from the collections.

T Range and Orchid Houses

Two permanent beds in the *Nepenthes* house were taken out, the soil renewed and a number of new plants inserted. In House No. 10 the *Victoria amazonica* produced only a small number of fertile seeds, due probably to lack of sun. The plant developed and flowered freely, the fruits appeared to develop normally, but only a few seeds reached maturity in each fruit. Rebuilding and extension of the Orchid show houses was continued during the summer. The engineers installed new hot water pipes and valves, and made provision for a heating coil to be installed at a later date in the border outside the new house. The new show houses provide much more light, more headroom, and better growing conditions. The two largest houses are devoted to tropical and sub-tropical epiphytic and ground orchids, together with epiphytic Bromeliads and ferns.

No less than 71 species, a record number, were added to the orchid collection during the year. These came chiefly from Costa Rica, Dominica, New Guinea, British Guiana, Fiji, Panama, Sarawak, and Tropical Africa. The flowering of *Bulbophyllum schimperianum*, *Hexisia oppositifolia*, *Epidendrum endresii*, and *Miltonia warscewiczii* was of special interest.

Palm House

In January the re-soiling of the permanent beds in the middle section of the Palm House was started; over 400 cubic yards of compost composed of loam, leafmould, peat and sand were used. The operation, greatly assisted by the use of the soil mixing machine, was completed in a period of six weeks. In some instances to save both time and labour large specimen palms and trees were placed in their permanent position before the beds were filled. Final planting was completed in May. The palms and Cycads in the north and south wings respectively were re-arranged, and many of the large overgrown specimens put into new tubs. The response of plants to the better growing conditions has been remarkable. Copious new growth was made during the summer, and a number of *Musa* plants reached maturity in nine months and then commenced to flower and fruit. The Cycads after being rearranged in June, made so much growth that they had to be given more space to develop by the time December was reached. The York stone paths which had become slippery are being refaced, and the opportunity taken to replace the prefabricated edging situated around the various beds.

The steps and York paving stone leading into the Palm House from the Terrace were overhauled, cleaned, and all broken stones made good where necessary.

Arboretum South

Despite appalling weather conditions made up of a dry, cold spring, a very wet summer and autumn, and extended foggy periods in early winter, the department's work has progressed whilst the plants in the collections have thrived and put on good growth. In January, sharp frosts tended to sear and shrivel the winter blossoms until only the hardy *Hamamelis* species and varieties remained. After early snow in February, milder conditions prevailed and *Crocus* and Snowdrops flowered profusely. On the 12th February, *Cornus mas* and *Abeliophyllum distichum* were in full flower, and were followed a few days later by *Forsythia giraldiana*. From thence onwards cold winds with lower temperatures continued and two inches of snow fell on the 5th April. Retarded by the cold, *Rhododendron adenocarpum* produced its apple-blossom pink flowers to perfection as the milder weather arrived in mid-April. The dry spring which followed was not conducive to good displays of *Narcissus* species and varieties, yet the Magnolias on the whole blossomed to perfection. By the end of April irrigation was being carried out on the new Rhododendron plantings, but threats of a serious drought receded as a period of heavy rain set in.

The conversion of the Rose Dell into a Heath Garden was completed. The site, which is pleasant and undulating, has been planted with some 20,000 Ericas of which 3,000 plants were donated by the Regius Keeper of the Royal Botanic Garden, Edinburgh. The collection of species of *Rosa* is now being reorganised and replanted, and comprises some 200 different recognized species and forms.

In general the bad weather conditions were not favourable to the collection of good and viable seed, Rhododendrons in particular being poor. Exceptions to this were *Maclura pomifera*, *Podocarpus alpinus* which produced an appreciable quantity of its bright red-plum shaped fruits, whilst the *Corylus* species which normally do not fruit did so prolifically. During the past year, there were 7,000 packets of seed sent away as part of the exchange system.

The department continues to be responsible for composting, the fullest use being made of all suitable material. The supplies of waste organic material from the gardens have been boosted by large quantities of spent hops acquired from a local brewery. Attention had been given to the colonies of Ground Elder which have of recent years increased. They have been greatly reduced in one year by the frequent cutting with a mechanical rotary mower.

The condition of a number of large Beech trees in the department gives cause for some anxiety. There is difficulty in drawing a distinction between safe and dangerous trees as their behaviour varies with the type of weather experienced during the summer. They are most likely to shed limbs on hot still days during a dry period. Constant attention is being given to this problem, though it is very difficult to keep pace with the amount of work involved.

Arboretum North

Losses continue amongst the older trees though they have not been so heavy as in previous years, and of the half dozen removed because of their dangerous condition, the largest was the older specimen of *Alnus glutinosus* which grew at the Pond side, near Museum No. I. In addition to unhealthy trees two specimens of *Araucaria araucana* growing in the large *Lonicera* bed have also been removed. To allow for future development, the last of the large Elms in the NE. corner of the Mound Garden has also been removed. Branch thinning and the removal of dead wood from specimen trees has continued. Trees having large limbs that could prove a possible source of danger, have been safeguarded by the bracing of branches with flexible steel cable. The method of fixing did not involve drilling of the limbs and the strong steel cable should provide many years of adequate support without further attention. Experimental work has been continued with a new bituminous tree wound sealer which contains a copper fungicide. The results so far have proved very satisfactory. The wet summer and autumn resulted in heavy crops of grass and the mowing of lawns at times was extremely difficult. Very little hand scything was practised as one 24 inch rotary motor scythe was able to keep down all the rough grass beneath the trees, and in those areas where the ordinary machines cannot function.

The spring display of bulbous plants used to embellish both shrub borders and beds, was again very good, and the flowering of most trees and shrubs well above the average. Possibly the milder weather following the earlier cold in spring was responsible. Rhododendrons and, in particular, the large groups along the Broad Walk, presented a fine feature. Undoubtedly the improved health and flowering of these plants may be attributed to the spraying programme carried out of recent years. Rhododendron Bug and Leaf Hopper had become very serious pests and the spraying with Pyrethrex has undoubtedly brought about a big improvement. Mulching with leaf mould and compost has also helped. Near Cumberland Gate, along the new Camellia Walk from Victoria Gate to North Gallery, both old and young Camellias flowered well. The older plants mainly centred in the Cumberland border require further thinning and replanting if the best results are to be obtained in the future. Special attention must be drawn to the flowering of *Magnolia* × *veitchii*, *Aesculus indica*, *Cladrastis sinensis*, *Prunus sargentii*, *Acer opalus*, *Catalpa speciosa*, and also to the large groups of *Malus* and *Prunus* (Japanese Cherries) which are so spectacular that they are much admired and appreciated by the public. As has been customary since the war, large plantings of spring flowering bulbs have been carried out, these consisting chiefly of *Crocus*, *Narcissus*, *Eranthis* and *Galanthus*. Several plantings of *Cyclamen neapolitanum* have been made, and when these are established should prove an additional feature of the grounds.

Decorative Department

The early Darwin and May-flowering Tulips proved the main feature of the spring bedding display, and with the absence of long continual periods of frost the wallflowers, pansies and aubrietias gave a colourful and contrasting display with the tulips. In the summer, displays of Pelargoniums and Petunias and other such plants were affected by the continual dampness and lack of sunshine, although they all made excellent growth. The

display in the Rose Garden in June was well up to standard, though later the extremely wet weather brought about rotting of flowers in the bud stage. Of recent years many new varieties of Rose have been introduced, and this has helped to add to the interest displayed by the public. Despite the unfavourable season Black Spot was not prevalent.

In the Conservatory the spring display was particularly effective, whilst throughout the summer season the House was kept well furnished with a wide variety of flowering plants. In autumn, the poor growing conditions in the House reduced considerably the length of the display of the Chrysanthemums. Lack of adequate roof-ventilation coupled with the damp atmospheric conditions resulted in plants having to be removed from the House after six to eight days, whereas normally they would have remained at least a fortnight.

The lean-to sheds adjoining the boundary wall in Shaft Yard were demolished and new and better permanent storage sheds erected. Nearer to the gate a new coke storage bin has been built which will accommodate some hundreds of tons as a reserve, that can be drawn upon should extreme weather conditions make normal coke deliveries difficult. Sections of the stone retaining wall on each side of the steps north and south of the pond facing the Palm House have been rebuilt. Better quality stone has been made use of, and the turf adjoining the top of the bank has been lifted and relaid. The lawn on the Terrace surrounding the Palm House was also re-turfed in order to make good the damage done during renovations to the Palm House. This work was carried out by contract.

Temperate Department

The painting of the interior of the Temperate House, which was commenced in October 1957, continued into February of this year. As a result, the gardening staff in the House were mainly occupied during the first three months of the year in pruning and taking down climbing plants ahead of the painters and scaffolders and in replacing them when work was completed. Little could be attempted in the way of a normal winter's work and no resoiling of beds was done, but the extensive scaffolding made it convenient to reach otherwise inaccessible parts of the building and the opportunity was taken of pruning some of the taller trees and of inspecting and where necessary renewing supporting wires fixed to the roof girders.

Two further sections of iron plant-stage were replaced by concrete benches, and during this work some replanting of climbing plants was done in positions which are normally difficult to reach.

Electric soil warming cable was laid under a part of the bed in the Australian House, as it seemed possible that higher soil temperatures would favour some plants liable to root rot under our conditions. The flowering of *Clianthus formosus* and of *Anigozanthos manglesii* in a most adverse summer suggested that some benefit was being obtained.

A rare and little-known plant, *Elinghamita johnsonii* (*Myrsinaceae*) endemic in West Island, Three Kings Islands, New Zealand, flowered for the first time here, as did *Lobelia grayana*, an Hawaiian species raised from seed sent by Dr. Rock. In each case photographs were taken and herbarium material preserved. *Butia yatay*, *Phormium colensoi*, *P. tenax* and *Pisonia brunoniana* all

flowered and fruited very prolifically, the last-named plant producing an abundance of its extremely viscid fruits which through the accident of their occasionally trapping small birds have earned it in New Zealand the name of 'Bird-catching tree'.

The demand for seeds from the Department continues to grow and 1,342 packets of seed from tender plants were distributed from last year's collection, the highest figure on record. There is also a slight increase in the number of items offered in the 1958 list.

A collection of Conifers including many temperate species was staged for the Open Day exhibition held at the Herbarium in May. In association with Dr. Melville an exhibit of Australian Acacias was put up at the Linnean Society's meeting on December 4th. Climbing plants were supplied for Darwin's glasshouse at Down House and other material was provided for the Darwin-Wallace centenary celebrations. Five plants were shown at meetings of the Royal Horticultural Society. Two Awards of Merit and two Cultural Commendations were received. *Hibiscus pedunculatus*, *Banksia collina*, *Acacia adunca* and an unnamed *Cyrtanthus* (Milne-Redhead & Taylor 10735) were supplied for figuring for the Botanical Magazine.

The excavation and resoiling of a very badly drained bed is in progress as the year ends, this involving the removal and replacement of about 100 cubic yards of material.

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Plant nomenclature.*—With the publication of this book by such a master of the intricacies of plant nomenclature as Professor St. John, one might have expected an authoritative text for the guidance of students and those who for one reason or another require to determine the correct names of plants. Regrettably, nothing of the kind is attempted, there being a scant five and a half pages of explanatory text, and three pages of 'Useful Publications', often of little significance from a nomenclatural point of view, in the introductory chapter, followed by 131 pages, divided into six chapters, of 'cases' numbered 1 to 958.

One of the 'cases',—that of *Cydonia oblonga* is worked out, step by step, in the introduction. Emphasis is laid upon meticulous accuracy, but Prof. St. John's terminology is scarcely accurate. On p. 5, for example, he writes '. . . . under the valid generic name *Cydonia* (1768)', meaning only that *Cydonia* is the accepted generic name of a genus in the system which he has adopted. Incidentally, *Cydonia* was first validly published in 1754 (Miller, Dict. abr. ed. 4), not 1768, and the correct reference is given in 'Index Kewensi'. Also on the same page '. . . . tautonyms are now invalid, ...' is an error for 'tautonymic epithets are illegitimate'.

In looking through the 'cases', it is not clear whether the student is to assume that the names given are to be regarded as taxonomic or nomenclatural synonyms or, in appropriate places, homonyms, or whether these facts are to be established; in any event, the availability of an exhaustive taxonomic library is naively assumed.

Having worked out the 'cases' the student has no means of checking his results. That some kind of check is required is implied on p. 2.—'Each student who is assigned a case investigates it, finds and evaluates each publication cited, searches for other pertinent facts . . . . The student gives his interpretation before the class, the members of which serve as a jury . . .'

The qualifications of the jury seem to be inadequate, and there is no word concerning the functions of the judge. One imagines a whole series of miscarriages of justice, though it should have been a basic feature of such a book that the idea of justice is neither explicit nor implicit in the Code. The student's knowledge of the Code is assumed to be complete and the application of the Code automatic.

A. A. BULLOCK.

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* *Nomemclature of plants*. A text for the application of the case method of the International Code of Botanical Nomenclature. By H. St. John. Pp. v + 157. New York: The Ronald Press, 1958. Price $2.50.

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Welsh flowers.*—Botanists, professional and amateur, owe a debt of gratitude to the authorities of the National Museum of Wales for the energy and skill they have shown in putting the Welsh flora 'on the map'. Most of us have, at some time, sought and found the information we required in the first edition of 'Welsh Flowering Plants', or in the excellent companion volumes on Trees and Ferns, and we will all welcome this second edition of the volume on phanerogams. It is particularly gratifying to note how much field-work has been done since the publication of the first edition, and to learn that several new county Floras are in course of preparation. The rich flora of Wales has been poorly publicized, as a glance at the bibliography in the present volume (pp. 200–201) will show, and, without in any way detracting from the importance of poetry and song in a national culture, one might diffidently recommend to every Welsh patriot the scientific study of his native (and introduced) vegetation. It would be a pity if the Museum publications came to be regarded as an end in themselves, and not as a stimulus to more detailed and more exhaustive researches. In the meantime we can assure all those who may be planning a botanical holiday in Wales that 'Welsh Flowering Plants' will supply all the information that the field-worker usually requires. It will certainly help us to escape the misfortune of recording as new that which is already known, or, worse still, of passing by, as known, that which is in fact novel.

R. D. Meikle

* *Welsh Flowering Plants*. By H. A. Hyde and A. E. Wade, 2nd edition, revised by A. E. Wade. Pp. 209. Cardiff: National Museum of Wales, 1957. Price 12/6.

The identity of *Glochidion ? cinerascens* Miq. and of *Rhamnus incanus* Roxb.

R. D. Hoogland (Canberra)

Both these names are referable to *Alphitonia* as was already suggested by Kurz in Journ. Bot. **11**: 207 (1873).

Glochidion ? cinerascens was described by Miquel from a specimen collected in Sumatra. The type specimen in the Utrecht herbarium (36220), which was kindly put at my disposal, clearly represents an *Alphitonia*. It does not appear to agree with any of the species accepted by Braid in his 'Revision of the genus *Alphitonia*' in Kew Bull. **1925**, 168–186 (1925) and the following synonymy is suggested:—

Alphitonia cinerascens (*Miq.*) *Hoogl.* comb. nov.

Glochidion ? cinerascens Miq., Fl. Ind. Bat., Suppl. 451 (1861); Kurz in Journ. Bot. **11**, 207 (1873)

Phyllanthus cinerascens (Miq.) Muell. Arg. in DC., Prodr. **15** (2), 314 (1866), non Hook. & Arn. (1837)

Rhamnus incanus Roxb., '*Alphitonia incana* T. & B.', and '*Alphitonia moluccana* T. & B.' are synonymous (Kurz, l.c. 208). It is obvious that *Alphitonia incana* is the correct name for this species in the genus *Alphitonia*. Though Kurz did not indicate which of the names he accepted and the validity of his publication can be disputed, we may accept his publication of the combination as valid since no further binomials are involved.

Alphitonia '*moluccana*' was recorded by Braid (l.c. 184) from Borneo, Celebes, the Moluccas (Amboina, Aru, Timorlaut, Ternate), New Guinea, and Australia. In my experience it is common and widespread in New Guinea in secondary vegetation from about sea level to c. 2500 m. altitude.

The type of *Rhamnus incanus* Roxb. was grown in Calcutta from seeds received from the Moluccas and a drawing is present in the collection of Roxburgh drawings, in the Library of the Royal Botanic Gardens, Kew (cf. Sealy in Kew Bull. **11**, 376 (1957)). Mr. L. L. Forman kindly compared this drawing with the type specimen of *Alphitonia moluccana* T. & B. ex Braid and his conclusion is that Kurz was certainly correct in suggesting them to be conspecific. The synonymy of this species runs as follows:—

Alphitonia incana (*Roxb.*) *T. & B. ex Kurz* in Journ. Bot. **11**, 208 (1873)

Rhamnus incanus Roxb., Hort. Beng. 17 (1814), nomen nudum; Fl. Ind. ed. Carey & Wall.) **1**, 603 (1832)

Alphitonia moluccana T. & B., Cat. Hort. Bog. 221 (1855), nomen nudum; Kurz in Journ. Bot. **11**, 208 (1873), nomen nudum; ex Braid in Kew Bull. **1925**, 184 (1925)

Variation in the flowers of *Ranunculus circinatus* Sibth.

E. J. Salisbury

Finding some notes made upon this species, when it appeared in abundance at Little Tring Reservoir in 1929, comparison shewed that the data obtained differed significantly from the description in 'The Flora of the British Isles' so that it seemed desirable to place these data upon record. In this flora *R. circinatus* is stated to be perennial with flowers 8 to 18 mm. in diameter containing 15 to 20 stamens and with carpels that are glabrous or with few hairs.

At Little Tring this species was so abundant in 1929 as to cover a very large area of the water almost continuously. But when the reservoir was visited again about the same period in June of 1930 no individuals could be found and only one or two the year following. This, as well as my experience in cultivating the species in an artificial pond at Radlett, led me to conclude that the species may be normally an annual. Moss in 'The Cambridge British Flora' also Coste and Hegi refer to this species as perennial but one would like to know upon what evidence the statement is based. *Ranunculus hederaceus* and *R. lenormandi* are normally, perhaps always, annual although commonly stated to be perennial and the presence of seedlings developing near the parent plant, before this has completely perished, may have been responsible for the assumption that such species and *R. circinatus* are perennials. The statement that all these Water Buttercups are perennial may sometimes be true, notwithstanding, but it could also be an uncritical repetition of a statement that may never have been based upon accurate observation and if partly true is probably the exception rather than the rule.

Most of the flowers at Little Tring had a diameter of from 12 to 15 mm., comfortably within the range of size cited in 'The Flora of the British Isles' and Moss mentions a diameter 'up to 2 cm., from which it would appear that these Hertfordshire specimens were not abnormally developed. Nevertheless, whereas both Moss and Clapham give the range in number of stamens as 15 to 20, only about 17 per cent of the flowers at Little Tring came within these limits. The stamens were counted in a total of 175 flowers of which 33 were collected on 21st June and 142 on 1st July. The mode was the same on both dates (namely 22 stamens present in 53 blooms, i.e. 30 per cent), so that the observations are dealt with collectively.

TABLE 1. Range of variation in the number of stamens per flower in a sample of 175 flowers of *Ranunculus circinatus*.

Number of stamens	Number of flowers
15	2
16	2
17	2
18	6
19	7
20	11
21	26
22	53
23	35
24	19
25	8
26	2
27	2
Total	175

These data although from one locality only nevertheless represent a substantial sample.

It will be obvious that the curve of meristic variation is of the normal form but whereas the lower limit is the same as that given by Moss and Clapham the upper limit to the number of stamens they cite is *below the modal value* for the Little Tring flowers which moreover present an upper limit of 27.

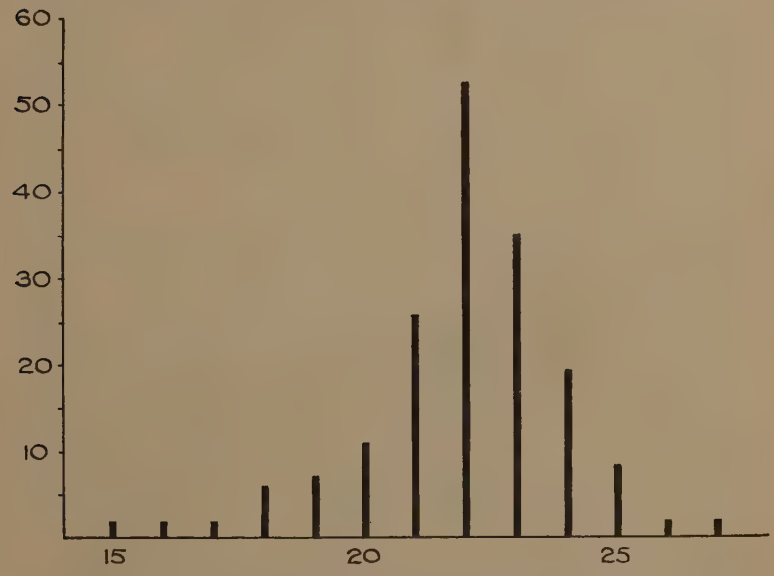

FIG. 1. Diagram showing range of variation in the number of stamens per flower in a sample of 175 flowers of *Ranunculus circinatus*.

All the carpels examined were hairy with minute hairs. They were not counted in a sufficient number of specimens to warrant stating a modal value but the average was 45 ± 2 carpels. The smallest number observed was 31 and the largest 56. Moss gives the range as about 30 to 35 which was probably based on an examination of herbarium material and may well have represented the number of maturing achenes rather than the number of carpels in the flower.

The flowers of *R. circinatus*, it may be noted, emit a faint almond-like scent.

Tropical agriculture.*—A welcome has already been given in these pages to books on Rice, Cocoa, and Tea, three volumes in a Tropical Agriculture Series published by Longmans, Green & Co. To these has now been added a fourth, An Introduction to Tropical Agriculture, which was begun by the late Sir Harold Tempany and completed by D. H. Grist. The authors write with wide experience. Tempany served in the Leeward Islands, then in Mauritius and Malaya as Director of Agriculture, before becoming Agricultural Adviser to the Secretary of State for the Colonies. Grist had long service in Malaya as agricultural economist and is the author of books on Malayan Agriculture and on Rice.

Since the start of Tempany's service in 1903, great changes in outlook on tropical agriculture have taken place. Not only has much knowledge been gained, but there has come a greater realisation of how much has yet to be learnt, and, above all, how different is farming under tropical conditions from that in temperate lands. The authors devote the first part of their book to describing the Tropical Background which shapes the form of agriculture; the climates of the tropics, their soils, the provision for research and for advisory services. There follows the main part of the book headed Agricultural Practice in the Tropics, in which are discussed in 16 chapters soil conservation, agricultural systems, irrigation and drainage, crop improvement, animal husbandry, and other important branches of agriculture. In a third smaller part, dealing with Economics, consideration is given to marketing of produce, land tenure, and finance.

This book covers ground which no other does, and it will be valued by all who have to do with tropical agriculture as filling a realised need. The mass of information it contains is impressive, as are the wideness of the authors' field of vision and their grasp of agricultural affairs in so many different countries. No words are wasted. The book is written with almost the conciseness and impersonality of a colonial report so that we may miss in it some of the brightness and colour of the tropical scene. Some criticism may be directed at deficiencies in the bibliography. Covering so wide a field, the authors necessarily touch many subjects with brevity and it would have helped the reader if he could have been guided to adequate sources of information. The book is attractively produced, with some well-chosen illustrations. A few errors were noted, the chief being a substitution of Barbuda by Bermuda, a very different place.

T. A. Russell

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* *An introduction to tropical agriculture.* By H. Tempany and D. H. Grist. Pp. xvi + 347, 4 colour plates (5 illustrations), 8 half-tone plates (17 illustrations), 6 figures (maps and diagrams). London: Longmans, Green and Co. Ltd., 1958. Price £2.

The Latin name of the Black Wattle

J. P. M. Brenan & R. Melville

The well-known Australian Black Wattle, so important commercially in many parts of the world on account of the use of its bark for tanning purposes, has been generally known scientifically either as *Acacia decurrens* (Wendl.) Willd. var. *mollis* Lindl. or as *A. mollissima* Willd.

The name *A. decurrens* var. *mollis* was published by Lindley in Bot. Reg. **5**, t. 371 (1819), with a good description and plate. Mr. E. J. H. Corner kindly informs us that there is no specimen of this in the Lindley Herbarium at Cambridge University, nor has authentic material come to light elsewhere. Nevertheless the description and plate are sufficient to fix beyond reasonable doubt the identity of *A. decurrens* var. *mollis* with the Black Wattle, and those who consider it as no more than a variety of *A. decurrens* may safely continue to use the varietal name *mollis*.

However, those who are familiar with the Black Wattle and its relatives in their native condition in Australia maintain that the Black Wattle is specifically distinct from *A. decurrens* (Wendl.) Willd. Examination of the rich material of the group in the Kew Herbarium gives emphatic support to that opinion. As a species, the Black Wattle has been generally known as *A. mollissima*, first described from a cultivated plant at Berlin by Willdenow, Enum. Hort. Berol. 1053 (1809). His description is as follows:—

'*22. Acacia *mollissima*.

A. inermis, foliis bipinnatis, partialibus quindecimjugis, propriis 11- ad 15-jugis linearibus obtusis glabris, petiolis ramulisque hirtis. Mimosa mollissima. *Hortulan.*

Habitat in Nova Hollandia. ♄. T.

Ramuli subangulati, ut petioli dense hirti. *Foliola* minuta valde approximata linearia obtusa utrinque glabra. *Flores* nondum vidi.'

The asterisk before the number indicates that it was a species not distinguished by or unknown to Linnaeus. No earlier publication of the name *Mimosa mollissima* has been traced.

An examination of Willdenow's description shows certain remarkable discrepancies with the Black Wattle, notably the description of the leaflets as 11–15-jugate and glabrous on both sides, and perhaps also the mention of '*Ramuli* . . . ut petioli dense hirti.' In the Black Wattle the leaflets are 16–70-jugate and ± densely puberulous or pubescent. Lindley himself, when describing *A. decurrens* var. *mollis*, had doubts of its identity with *A. mollissima*, for he wrote (Bot. Reg. **5**, sub t. 371 (1819)):—'We should have thought that the ACACIA *mollissima* of Willdenow's Enumeratio Horti Berolinensis was intended for this plant, had not the leaflets in that been described as 11–15-paired.' The confusion seems to have started with Sweet's Fl. Austral. t. 12 (1827–8), who pictured, under the name *A. mollissima*, a plant much resembling the Black Wattle, and it was continued by Bentham in Hook., Lond. Journ. Bot. **1**, 385 (1842), who described the Black Wattle under the

name *A. mollissima*, distinguishing it specifically from *A. decurrens* (Wendl.) Willd. and from the Silver Wattle, *A. dealbata* Link, and citing *A. decurrens* var. *mollissima* Lindl. [sic] as a synonym of *A. mollissima*. Since then, the name *A. mollissima* has been generally considered to refer to the Black Wattle.

In view of the discrepancies mentioned above in Willdenow's description and of Lindley's doubt, it seemed necessary to find out what *A. mollissima* of Willdenow really was, and enquiry was made at Berlin. There is an authentic specimen, presumably a holotype, in Willdenow's herbarium (No. 19152). Regulations do not permit specimens in this herbarium to be lent, but through the kindness of the Director of the Botanisches Museum at Berlin, an excellent photograph of Willdenow's type, together with an enlargement showing part of the specimen, were courteously presented to Kew. A glance at these is sufficient to show that Willdenow's plant is certainly not the Black Wattle. The few-jugate leaflets, the short pinnae, and above all the coarse spreading indumentum on the branchlets and leaf-rhachides, are all distinctive and differ from the Black Wattle. They can however be perfectly matched with numerous specimens of *Acacia pubescens* (Vent.) [R. Br. in] Ait. f., Hort. Kew., ed. 2, **5**, 467 (1813) (*Mimosa pubescens* Vent., Jard. Malmaison, t. 21 (1803)). Moreover this identification has already been made, probably by Willdenow himself, for there is a manuscript label on Willdenow's specimen bearing the name *A. mollissima* and the diagnosis in Willdenow's words, and underneath, in the same hand, 'Mimosa pubescens *Jard. Malmais.* t. 21'. Had this identification been published in the Enumeratio Horti Berolinensis, much subsequent confusion and annoyance might have been saved. Unfortunately as it is, there can be no doubt that *Acacia mollissima* is a synonym of *A. pubescens*. The latter name is fortunately not endangered, since *Mimosa pubescens*, upon which *A. pubescens* was based, was published in 1803, while *A. mollissima* did not appear until 1809.

As a result of all this, it seemed as if the Black Wattle might never have been given any specific name of its own. However, by a strange mischance, the Black Wattle has been described as an allegedly new species endemic to East Africa, *Acacia mearnsii* ['mearnsi'] De Wild., Pl. Bequaert. **3**, 61 (1925). Two specimens were cited, *Mearns* 1092, fron near Thika in Kenya, and *Mearns* 249, from near Nairobi. Thanks to the courtesy of Prof. Dr. W. Robyns, the original sheets of both these numbers at Brussels have been made available for examination. *Mearns* 1092 is the Black Wattle, while *Mearns* 249 is *Acacia dealbata* Link, the Silver Wattle; the former is in flower, the latter in bud only, and it seems clear from the description of *A. mearnsii* that it was predominantly based on *Mearns* 1092, there being scarcely anything in it that *must* have been derived from *Mearns* 249, but on the contrary a good deal of matter that could have come only from *Mearns* 1092. *A. mearnsii* should accordingly be typified by the specimen *Mearns* 1092 which was the only specimen actually annotated as *A. mearnsii* by De Wildeman and is proposed as the lectotype.

A careful search of both the relevant literature and specimens has unfortunately revealed no earlier specific name for the Black Wattle, and the reluctant conclusion must be reached that it must, as a species, bear the misconceived and not especially relevant or appropriate name of *Acacia mearnsii*. The citations and synonymy are as follows:—

Plate 1

The type-specimen of *Acacia mollissima* Willd. in the Willdenow Herbarium at Berlin (No. 19152). Photograph by courtesy of the Director, Botanisches Museum, Berlin-Dahlem.

[*To face page* 38

Plate 2

Enlargement of part of the type-specimen of *Acacia mollissima* Willd. in the Willbenow Herbarium at Berlin (No. 19152). Photograph by courtesy of the Director, Botanisches Museum, Berlin-Dahlem.

To face page 39]

Acacia mearnsii ['mearnsi'] *De Wild.*, Pl. Bequaert. **3**, 61 (1925).

Acacia decurrens (Wendl.) Willd. var. *mollis* Lindl. in Bot. Reg. **5**, t. 371 (1819).

[*Acacia mollissima* sensu auct. mult. e.g. Bentham in Hook., Lond. Journ. Bot. **1**, 385 (1842), *non* Willd. quae = *A. pubescens* (Vent.) [R. Br. in] Ait. f.].

Arctic botany.*—This is the first of four volumes on Arctic botany in which Professor Polunin sums up the accumulated knowledge of more than twenty years of study and field-work. It is the first modern flora to cover the vast, complex region north of the polar tree-line. 892 species of vascular plants are recognized and described, each illustrated by a line drawing. The author has a way all of his own in dealing with enumeration, keys and descriptions of species in the larger genera, as he explains in an introduction full of qualifying clauses and parentheses. The same, too, with records and evidences: who but Professor Polunin would have written, 'Where possible a confirmatory specimen, or at all events scrap, should accompany suggestions and communications'?

Arctic plants in many genera are, or have become, notoriously 'critical' and the author has been handicapped, as he confesses, by lack of material from the Russian portion of his area. He has decided to lump, and very many of his species are 'sensu latissimo', 'sensu lato' or 'agg.', the names being followed by 'syn.' or 'incl.' preceding one or more binomials. This being so, it was perhaps unfair to suppress the names of authors of all names except those of accepted species, which themselves appear 'fully dressed' only beneath the line-drawings and in the index. Again, citations of papers on critical plants should surely have been given here, under individual genera or in a bibliography, whereas we are told that we shall find them in a companion volume.

If it is easy to criticize the author's taxonomic conservatism (except in certain genera such as *Antennaria*), we must surely be grateful to him for setting so much information in convenient form, and for his generous diagnoses and descriptions which give the impression of care and accuracy. Besides, the lumping treatment may well be the right one at the moment, in a flora such as this. It is clear that most arctic plants, especially in difficult genera, still need detailed specialist study from every angle, and long discussions of plasticity and variability do not get us very far and take up much space. Let us be thankful, above all, that Professor Polunin has abstained from creating a multitude of subspecies, a course he might well have adopted in order to be in a certain fashion. And what a godsend his flora will be to harassed herbarium workers, who have to produce lists of names for travel-book writers and amateur collectors in this frigid region.

N. Y. SANDWITH

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* *Circumpolar Arctic Flora.* By Nicholas Polunin. Pp. xxviii + 514 and many text figures. Oxford: The Clarendon Press, 1959. Price 6 guineas.

Nomenclatural notes: XII*

THE TYPES OF SOME GENERIC NAMES

A. A. Bullock

The typification of certain generic names became necessary during the preparation of a list of *nomina familiarum conservanda proposita*. The inclusion of these names in *Index Nominum Genericorum* also awaits formal typification, though provisional cards for some of them have appeared already.

Alstroemeria *Linnaeus*, Diss Alström. (J. P. Falck) 10. 1762†.—Sp. Pl. ed. 2 461. 1762. (*Alstroemeriaceae*).

A. pelegrina *Linnaeus, l.c. cum tab.*, et *l.c.* 462.—Lectotypus nominis generici.

Three species, *A. pelegrina*, *A. ligtu*, and *A. salsilla* were originally included in *Alstroemeria*, but the third is now referred to *Bomarea* Mirbel (1804). Of the other two, *A. pelegrina* was known to Linnaeus as a cultivated plant and he provided a figure of it, with analyses, in the dissertation. It is a fairly obvious choice as lectotype of the generic name.

Balanops *Baillon*, Adansonia 10: 117. Aug. 1871 (*Balanopaceae*).

B. vieillardii *Baillon, l.c.* 118.—Lectotypus nominis generici.

The generic description contained a very full account of the fruit and seed, but the fruit of only one of the two original species was known to Baillon. This was *B. vieillardii*, whilst of the other, *B. pancheri*, he saw only very young female flowers. The choice of the former as lectotype of the generic name is, therefore, preferable.

Casuarina [*Rumphius*] *Linnaeus ex Adanson*, Fam. Pl. 2: 481. 1763.—J. R. et G. Forster, Char. Gen. Pl. 103. 1776 (*Casuarinaceae*).

C. equisetifolia *Linnaeus ex J. R. et G. Forster, l.c.* 104. *t.* 52.—Holotypus nominis generici.

All the new names included in Linnaeus' *Herbarium Amboinense* were *nomina nuda* (the footnote '*Generis proprii, singularis arbor, Equiseti structura*' attached to *Casuarina* is scarcely acceptable as a generic description) but he did accept Rumphius' generic name. Adanson's description, giving valid publication of the name in 1763, also referred to the species figured by Rumphius, as did the more formal description by J. R. and G. Forster, who provided valid publication of Linnaeus' binomial.

Brunellia *Ruiz et Pavon*, Fl. Per. Chil. Prodr. 71. *t.* 12. 1794 (*Brunelliaceae*).

B. inermis *Ruiz et Pavon, l.c.*—Lectotypus nominis generici.

The analytical drawings given on *t.* 12 are undoubtedly referable to *B. inermis*, figured more completely in the volume (4) of *tabulae ineditae* (*t.* 414) of the definitive Flora of Peru and Chile, rather than to *B. aculeata* of which flowers were apparently unknown. A fruiting specimen is figured at *t.* 415.

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* Continued from Kew Bull. **13**, 391 (1959).

† The method of citation used in this paper is, for convenience, in conformity with that used in *Index Nominum Genericorum*—Editor.

Brunonia *J. E. Smith*, Trans. Linn. Soc. London 10: 365. *tt.* 28, 29. 1811 (*Brunoniaceae*).

B. australis *J. E. Smith*, *l.c.* 367.—Lectotypus nominis generici.

Smith described two species, *B. australis* and *B. sericea*. These are now regarded as conspecific and have been united under the former name.

Chailletia *A. P. De Candolle*, Ann. Mus. Hist. Nat. Paris 17: 158. *cum tab.* 1811 (*Chailletiaceae*).

C. pedunculata *A. P. De Candolle*, *l.c.* 159.—Lectotypus nominis generici.

De Candolle included two species, but *C. sessiliflora*, known to him only from a specimen with very immature flowers, has been transferred to *Tapura* Aublet (1775). The plate is derived almost entirely from *C. pedunculata*, the other species being represented as a fragment, without analysis. It is unfortunate that De Candolle did not at once realize that his *Chailletia* is congeneric with *Dichapetalum* Thouars (1806, holotypus: *D. madagascariense*); he later united the two genera (Prodr. 2: 57. 1825), but adopted the name *Chailletia* instead of *Dichapetalum*. The correct name of *C. pedunculata* is *Dichapetalum pedunculatum* (De Candolle) Baillon (Hist. Pl. 5: 140, *fig.* 222–3. 1874).

Chloanthes *R. Brown*, Prodr. 513. 1810 (*Chloanthaceae*)*.

C. stoechadis *R. Br. l.c.* 514.—Lectotypus nominis generici.

Robert Brown included two species, *C. stoechadis* and *C. glandulosa*. Of these, the former is better known so far as herbarium representation is concerned, and is accordingly nominated as lectotype of the generic name.

Columellia *Ruiz et Pavon*, Fl. Per. Chil. Prodr. 3. *t.* 1. 1794.—Fl. Per. Chil. 1: 28. *tt.* 8*a*, 12*b*. 1798 (*Columelliaceae*).

C. oblonga *Ruiz et Pavon*, Fl. Per. Chil. 1: 28. *t.* 8*a*. 1798.—Lectotypus nominis generici.

Two unnamed species were referred to the genus in 1794, analytical sketches of one of them being given. In 1798, when *C. oblonga* and *C. obovata* were named, described and figured, the analysis of 1794 was almost exactly repeated for *C. oblonga*, and that species is accordingly nominated as lectotype of the generic name.

Ctenolophon *Oliver*, Trans. Linn. Soc. London 28: 516. 1873 (*Ctenolophonaceae*).

C. parvifolius *Oliver*, *l.c.*—Lectotypus nominis generici.

Of the two species described by Oliver, it appears from the descriptions (both lengthy) that *C. parvifolius* was more completely known to him than *C. grandifolius* (*l.c.* 517) since the fruit and seed of the former are described but of the latter were unknown. Oliver doubtfully referred the genus to *Olacaceae* as a *genus anomalum*.

* This family is segregated by Hutchinson (Fam. Fl. Pl. ed. 2. 396. 1959) from the *Verbenaceae* of other authors.

Dipterocarpus *C. F. Gaertner*, Fruct. et Sem. Pl. 3: 50. *tt.* 187, 188. 1805 (*Dipterocarpaceae*).

D. costatus *C. F. Gaertner, l.c.* (*t.* 187).—Lectotypus nominis generici.

Gaertner included two species, but *D. costatus* was more completely described and figured than *D. turbinatus*. Both, however, were fruiting specimens and the choice of *D. costatus* is arbitrary.

Faba *Miller*, Gard. Dict. ed. 4 (abr.). 1754 (*Leguminosae*, *Fabaceae* vel *Papilionaceae*).

Vicia faba *Linnaeus*, Sp. Pl. 737. 1753.—Lectotypus nominis generici *Fabae*.

Miller listed two species, both included (one as a variety) in Linnaeus' earlier work. The genus *Faba* is now generally included in *Vicia* Linnaeus but there can be no doubt that *V. faba* Linnaeus var. *faba* must be regarded as the type of the name *Faba* Miller.

Goupia *Aublet*, Pl. Guian. 1: 295. *t.* 116. 1775 (*Goupiaceae*).

G. glabra *Aublet, l.c.*—Lectotypus nominis generici.

Of the two species listed by Aublet *G. glabra* is the one figured and more completely described, whilst the second, *G. tomentosa*, is very briefly distinguished from it.

Haemodorum *J. E. Smith*, Trans. Linn. Soc. London 4: 213. 1798.—R. Brown, Prodr. 299. 1810 (*Haemodoraceae*).

H. planifolium *R. Brown, l.c.* 300.—Lectotypus nominis generici.

Although Smith described the genus in 1798, it was not until 1810 that R. Brown referred five species to it. Of these, *H. planifolium* is well known in cultivation and was figured by Ker-Gawler in the *Botanical Magazine* (39: *t.* 1610) as early as 1814 when it was described from a plant that had flowered in November 1813 in 'Lee and Kennedy's nursery at Hammersmith and which had been raised from seeds imported by Mrs. Patterson'.

Hydrostachys *Thouars*, Nov. Gen. Madag. 2. 1806 (? 1808) (*Hydrostachyaceae*).

H. verruculusa *A. de Jussieu* in Delessert, Ic. Sel. Pl. 3: *t.* 91. 1837.—Perrier de la Bathie in Humbert, Fl. Madag. Fam. 89 Hydrostach. 5. *fig.* 1. 1952.—Lectotypus nominis generici.

Thouars described the genus in 1802, but it was not until 1837 that A. de Jussieu (in Deléssert, Ic. Sel. Pl. 3: tt. 91–94) referred four species to it. All of them are retained in the genus in Perrier de la Bathie's treatment of the family in Fl. Madag. (1952). No indication of a type was given by Thouars, who knew a number of species '. . . *folia diversa in speciebus diversis*'. Jussieu figured *H. verruculosa*, *H. imbricata*, *H. multifida* and *H. distichophylla* almost equally. Perrier de la Bathie enumerated no fewer than 18 species endemic in his flora area and did not select a type. Of the original four species, it would appear that *H. verruculosa* A. de Jussieu is as suitable as any for nomination as lectotype of the generic name.

Irvingia *J. D. Hooker*, Trans. Linn. Soc. London 23: 167. 1860 (*Irvingiaceae*).

I. smithii *J. D. Hooker*, *l.c.*—Lectotypus nominis generici.

Hooker included three new species in the genus, *I. tenuifolia*, *I. barteri* and *I. smithii*. Of these, the last was better known to him, the available specimens having both flowers and fruit, whereas the specimens of the other two species showed flowers only. Further, *I. smithii* is more widely distributed than the other two species, extending from West Africa eastwards through the Sudan to Uganda, and southwards to Angola.

Ixonanthes *Jack*, Malay. Misc.* 2(7): 51. 1822 (*Ixonanthaceae*).

I. icosandra *Jack*, *l.c.* 53.—Lectotypus nominis generici.

This is a quite arbitrary choice, based upon the fact that *I. icosandra* is perhaps more common and more widely distributed than *I. reticulata* Jack (*l.c.* 51), the other species assigned to the genus by Jack.

Lardizabala *Ruiz et Pavon*, Fl. Per. Chil. Prodr. 143. *t.* 37. 1794 (*Lardizabalaceae*).

L. biternata *Ruiz et Pavon*, Syst. Veg. 286. 1798.—Lectotypus nominis generici.

The figure in the earlier work gives drawings of the fruit and seed, as well as of male and female flowers. Of the two species listed later, the fruit of *L. biternata* only is mentioned and it seems clear that the drawings were taken from this species and not from *L. triternata* Ruiz et Pavon (*l.c.* 287).

Loasa *Adanson*, Fam. Pl. 2: 501. 1763 (*Loasaceae*).

L. urens *N. J. Jacquin*, Obs. Bot. 2: 15. *t.* 38. 1767.—Holotypus nominis generici.

The name *L. urens* was illegitimately changed to *L. hispida* Linnaeus (Syst. Nat. ed. 12. 1: 364. Nov. 1767)**. Adanson, Jacquin and Linnaeus cited the pre-Linnean *Ortiga chilensis urens* . . . . Feuillé (Journ. Peruv. 2: 757. *t.* 43. 1714); Jacquin also cited Adanson (1763) and Linnaeus (1767) cited Jacquin (1767 *prius*).

Lowia *Scortechini*, Nuovo Giorn. Bot. Ital. 18: 308. 1886 (*Lowiaceae*).

L. longiflora *Scortechini*, *l.c.*—Holotypus nominis generici.

The genus *Lowia* is commonly regarded as a taxonomic synonym of *Orchidantha* N. E. Brown, the latter having been published a few months earlier and based upon *O. borneensis* N. E. Brown. Under this classification the correct name of *Lowia longiflora* is *Orchidantha longiflora* (Scortechini) Ridley.

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* For a bibliographic account of this work, and appraisement of its contents, see Merrill, Journ. Arnold Arb. 33(3): 199–250. 1952.

**See Sprague, Kew Bull. 1929: 88–89. 1929.

Monimia *Thouars*, Hist. Veg. Iles Afr. Austr. ed. 1. 35, *t.* 9. 1804 (*Monimiaceae*).

M. rotundifolia *Thouars*, *l.c.*—Lectotypus nominis generici.

This is a completely arbitrary choice between the two original species. The other is *M. ovalifolia* Thouars.

Moringa *Adanson*, Fam. Pl. 2: 318. 1763 (*Moringaceae*).

M. oleifera *Lamarck*, Encycl. 1: 398. 1785.—Holotypus nominis generici.

Linnaeus (Sp. Pl. 381. 1753) described this plant as *Guilandina moringa* and the species is based upon *Morungu* Rheede, Hort. Mal. 6: 19. *t.* 11 (1686), cited by Linnaeus, Adanson and Lamarck. The name *Moringa pterygosperma* J. Gaertner, Fruct. et Sem. Pl. 2: 314 (1791) which has gained considerable currency for the same species, is superfluous.

Myoporum *G. Forster*, Fl. Ins. Austr. Prodr. 44. 1786 (*Myoporaceae*).

M. laetum *G. Forster l.c.*—Lectotypus nominis generici.

Although Forster attributed the generic name to Solander, the types of the plants described in the Prodromus are at Göttingen* and the type of this generic name may be selected from any one of the four species included in it. There is nothing in the protologue to indicate one rather than another, and *M. laetum*, a well known species of wide distribution commonly known as the Ngaio tree in New Zealand (*teste* Laing et Blackwell, Pl. New Zealand, ed. 3. 366. *fig.* 132. 1927), has been selected as lectotype of the generic name.

Pittosporum *J. Gaertner*, Fruct. et Sem. Pl. 1: 286. *t.* 59. 1788 (*Pittosporaceae*).

P. tenuifolium *J. Gaertner l.c.*—Lectotypus nomins generici.

Gaertner referred two species to *Pittosporum* and there is little to choose between them as a suitable type of the generic name. Gaertner's work was mainly concerned with fruits and seeds, and the protologue indicates that his material of *P. crassifolium* was less mature than that of *P. tenuifolium*. The latter, therefore, is nominated.

Sarcolaena *Thouars*, Hist. Veg. Iles Afr. Austr. ed. 2. 37. *tt.* 9–10. 1805 (*Sarcolaenaceae*).

S. multiflora *Thouars*, *l.c.* 40. *t.* 10.—Lectotypus nominis generici.

Thouars described three species.—*S. grandiflora*, *S. eriophora* and *S. multiflora*. All three were maintained by Cavaco (1952) in his account of the family (Chlénacées) in Humbert's Flora of Madagascar. *S. multiflora* appears to be better known than the other species, and is, accordingly, nominated as type of the generic name.

* Teste G. Schellenberg in litt. 14 Mar. 1931.—Confirm. C. E. Hubbard, MS. in bibl. Kew., 1955.

Thurnia *J. D. Hooker* in W. J. Hooker, Ic. Pl. 15: *tt.* 1407–1408. 1883 (*Thurniaceae*).

T. jenmanii *J. D. Hooker, l.c. t.* 1408.—Lectotypus nominis generici.

Thurnia sphaerocephala J. D. Hooker (*l.c. t.* 1407) was known to Hooker from a fruiting specimen only, whilst the nominated lectotype was known to him from a flowering specimen. There can be no doubt that the latter, which allowed observation of the stamens and ovary, is the more important from the point of view of classification at the generic level.

Tremandra *R. Brown ex A. P. De Candolle*, Prodr. 1: 344. Jan. 1824 (*Tremandraceae*).

T. stelligera *R. Brown ex A. P. De Candolle, l.c.*—Lectotypus nominis generici.

Of the two species listed by De Candolle, *T. stelligera* is an arbitrary choice, since there is nothing in the protologue to indicate one rather than the other.

Vellozia *Vandelli*, Fl. Lusit. Bras. Spec. 32. *t.* 2, *fig.* 11. 1788 (*Velloziaceae*).

V. candida *Mikan*, Delect. Fl. Faun. Bras. *t.* 7. 1820.—Lectotypus nominis generici.

Although *Vellozia* was described in 1788, its identity with *Xerophyta* A. L. de Jussieu (1789) was overlooked until 1827, when Pohl (Pl. Bras. Ic. Descr. 118) revealed the synonymy. The first binomial under *Vellozia* ('*Vellosia*') was *V. candida* Mikan (1820) and there is some justification for thinking that this is one of the two species known to Vandelli.

Xanthorrhoea *J. E. Smith*, Trans. Linn. Soc. London 4: 219. 1798 (*Xanthorrhoeaceae*).

X. resinosa *Persoon*, Syn. Pl. 1: 370. 1805.—Holotypus nominis generici.

Persoon was the first author to provide a binomial for the plant which J. E. Smith had described as representing a new genus, but without naming any species. According to W. J. Hooker (Bot. Mag. 79: *t.* 4722. 1853) this is the plant named *X. hastile* by Robert Brown (Prodr. 288. 1810) and accepted by Smith (Rees Cycl. 39: no. 3. 1819) and later authors. Persoon's prior epithet appears to have been much neglected, but Moore (Handb. Fl. New S. Wales 425. 1893) resuscitated it, citing *X. arborea* R. Brown (1810) as a synonym.

An all the year garden.*—This is a book which explains how it is possible to have a colourful and interesting garden throughout the year, The author describes how one should plan such a garden by selecting and 'planting effective foliage plants, berried shrubs, evergreens and plants that flower in the depths of winter as well as the more familiar plants that flower in the spring and summer'. The book is illustrated with excellent photographs, many of which were taken in the author's garden.

H. S. MARSHALL

* *An all the year garden.* By M. Fish. Pp. 144, colour frontispiece, 16 half-tone plates (43 illustrations). London: W. H. & L. Collingridge Ltd., 1958. Price 1 guinea.

Fungi venezuelani : II*

UREDINALES

I. Jørstad (Botanical Museum, Oslo)

The following collections of *Uredinales* were made by R. W. G. Dennis during a recent expedition to Venezuela financed by the Percy Sladen Trust. For host determination I am indebted to Mr. N. Y. Sandwith and Mr. C. E. Hubbard. All specimens cited have been deposited in the Herbarium of the Royal Botanic Gardens, Kew. A list of literature including the places of publication of the specific names adopted will be found at the end of the paper.

Aecidium adenariae *Mayor*

On *Pehria compacta* (Rusby) Sprague. Miranda: Cortada del Guayabo, watershed between Rio Guaire and Rio Tuy, 1400 m., July 9 (1865). Host determined by Dr. Lasser. Reported by Kern (1938 p. 539) on this host from a nearby locality; originally described on *Adenaria* in Colombia.

Aecidium desmodii *P. Henn.*

On *Desmodium sericophyllum* Schl. Mérida: Rio Chama valley, 1500 m. July 20 (2103). I.

Aecidia hypophyllous, not accompanied by spermogonia. Aecidio-spores variable, 16–28 × 15–23 μ, very finely verrucose, wall 1 μ thick.—This aecidial stage was previously known from Brazil and Bolivia; it is believed to belong to a heteroecious rust. *D. sericophyllum* is a new host.

Aecidium fuchsiae *Jacks. & Holw.*

On *Fuchsia* sp. Mérida: Sierra Nevada, La Mucuy, near Tabay, Aug. 6 (2494). 0+I.

This aecidial stage was previously reported from Bolivia, Peru and Guatemala.

Aecidium monticolae *Kern, Thurst. & Whetz.*

On *Hypericum laricoïdes* Gl. Mérida: Sierra de Santo Domingo, Mucubaji valley, 3560 m. July 26 (2038 A). I.

Cupulate aecidia crowded on leaves and stems of young shoots. Aecidio-spores 26–33 × 20–26 μ, wall 1–1·5 μ thick, extremely finely verrucose, practically appearing smooth. Spermogonia were not seen.—The specimen fits very well the description of *Ae. monticolae*, which was found on *Hypericum* sp. in Venezuela at Paramo de Mucuchies, Laguna Negra, at 3470 m. (Kern, Thurston & Whetzel, 1934 p. 265). It has not been reported since.

Aecidium superalpinum *Jørst.*, sp. nov.

Spermogoniis non visis. Aecidiis hypophyllis, in greges rotundatis dense aggregatis, 0·4–0·5 mm. diam., flavo-brunneis, hemisphaericis, poro centrali apertis; cellulis peridialibus plus minus rhomboideis, 26–55 × 12–29 μ, parieti exteriore 6 μ crasso, transverse striato, interiore c. 3 μ crasso, verru-

* Continued from Kew Bull. **13**, 405 (1959).

coso. Aecidiosporis globosis, subglobosis vel oblongis, 22–28 (33) × 19–24 (26) μ, episporio 1·5–2 μ crasso, hyalino, subtiliter verruculoso.

On *Senecio tabacon* Turcz. Mérida: Sierra de Santo Domingo, S. of Mucubaji, 4000 m. July 23 (2076B). *Type.*—Mucubaji lake, 3550 m. July 23 (2076A).

On? *Senecio* sp. Mérida: crest of Sierra de Santo Domingo, S. of Mucubaji, 4000 m. Aug. 3 (1856).

On *Compositae* (2 species), Mérida: Sierra de Santo Domingo, S. of Mucubaji, 4000 m. July 25 (1842); crest of Sierra de Santo Domingo, 4000 m. Aug. 3 (2500).

This aecidial stage resembles somewhat that of *Puccinia stipae* Arth., but the peridial cells are different. It is to be expected that it belongs to an alpine heteroecious rust which must be common in Sierra de Santo Domingo at 3500–4000 m., as it was collected 5 times on 4 different host species, of which unfortunately only one has been identified as to species.

Aecidium turnerae *P. Henn.*

On *Turnera ulmifolia* L. Miranda: slopes of La Silla above Los Palos Grandes (Caracas), 1000 m. June 29 (1480). 0 + I.

New to Venezuela. The rust has previously been found on the present host in Peru and Colombia, and also on *Piriqueta caroliniana* (Walt.) Urb. in Florida.

Aecidium venezuelanum *Jørst.*, sp. nov.

Spermogoniis hypophyllis, 150–200 μ latis, aecidiis circumdatis. Aecidiis epiphyllis, 0·2–0·3 mm. latis, breviter cylindriaceis vel cupulatis, margine brevi vix recurvato; cellulis peridialibus laxiuscule conjunctis, subrhomboideis, parietibus 3–4 μ crassis, verrucosis. Aecidiosporis subglobosis, ellipsoideis vel angulatis, 32–45 × 22–32 μ, episporio hyalino 2·5–4 μ crasso ex parte cum verrucis angulatis crebrisque usque 3 μ latis ornato, ex parte fere levi.

On *Aphelandra runcinata* Klotzsch. Mérida: Sierra Nevada, La Mucuy, Tabay, 2200 m., on seedling in forest trail, Aug. 6 (2181A).

It seems that no aecidial stage has previously been correctly reported on *Aphelandra* (*), nor any similar aecidial stage for members of other Acanthaceous genera. Apparently no rust has been reported previously on the present host.

Angiopsora compressa *Mains*

On *Paspalum conjugatum* Berg. Miranda: junction of Araguita and Altagracia roads, Guatopo, 800 m. June 25 (2219). II.

On *Paspalum* sp. Mérida: NW. of Mérida, 1600 m. July 17 (2099).

Uredosori with peripheral incurved paraphyses; uredospores 20–26 × 15–19 μ, with 1–1·5 μ thick wall and obscure, scattered germ-pores. In both collections the uredosori were largely destroyed by *Darluca filum.*—The rust was previously reported from Venezuela on *P. conjugatum* and various other species of *Paspalum.*

* According to P. & H. Sydow (1924 p. 75) *Aecidium aphelandrae* P. Henn. lives on the Rubiaceous species *Cephalanthus peruvianus.*

Angiopsora sp.

On *Paspalum* sp. Mérida: Sierra Nevada, above La Mucuy, 2500 m. Aug. 6 (2172). II.

Uredosori without paraphyses: uredospores 19–23 × 16–19μ, of similar type to those of *A. compressa*.

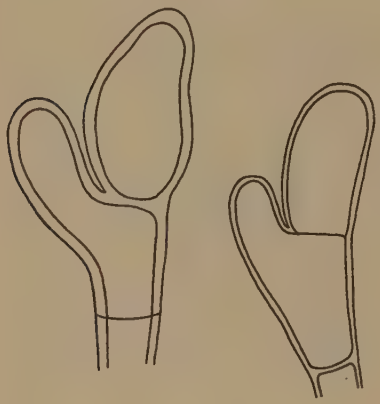

Fig. 1. *Chrysocyclus* sp. Teleutospores from No. 2044 (left) and 2501 (right), × 550.

Chrysocyclus sp.

On *Compositae*. Mérida: Sierra de Santo Domingo, Laguna Negra, 3440 m. July 26 (2044). III; same locality. July 27 (2501). Old o; III.

Teleutosori and spermogonia hypophyllous; teleutospores of the 'mitten-like' type characteristic of *Chrysocyclus*, 65–80 × 17–32μ (No. 2044) and 45–68 × 18–29μ (No. 2501); spore wall 1·5–2·5μ thick, pedicels 14–19μ broad and up to 26μ long. In both finds the host appears to be the same; it is a shrub probably belonging to *Compositae* and it is not identical with *Senecio greenmanianus* Hier., on which *Chr. senecionis* Davids. has previously been found in Venezuela, viz., at Laguna Negra, Paramo de Mucuchies, at 3470 m. (Kern, Thurston & Whetzel, 1934 p. 267), i.e., in the same area as the present finds. This rust species was described from Trujillo in Venezuela, on *Senecio* sp. Whether or not our finds belong to *Chr. senecionis* is uncertain, as the material is very scanty and the teleutospores young; however, the likeness is very close. Fig. 1.

Chrysopsora gynoxidis *Lagh.*

On *Gynoxis moritziana* Sch. Bip. Mérida: Sierra de Santo Domingo, Laguna Negra, 3440 m. July 31 (1857). o + III.

This rust species is new to Venezuela, and *G. moritziana* is a new host.

Desmella quitensis (*Lagh.*) *Thirum. & Cumm.* (syn. *Uropyxis quitensis* Lagh. ex Arth., *Edythea quitensis* (Lagh.) Jacks. & Holw.)

On *Berberis* sp. Mérida: Sierra de Santo Domingo, Laguna de Canoa, 3460 m. July 30 (1866). II + III; Laguna Negra, 3440 m. July 31 (2495). (II) + III.

The teleutospores are nearly sphaerical, thin-walled and with vertical septem. This rust species is previously reported from Ecuador and Bolivia, on various species of *Berberis*.

On some leaves of No. 1866 there occur old aecidial infections with epiphyllous spermogonia and hypophyllous aecidia, but the latter were too ruined for closer study. Possibly they belong to a grass rust of the *Puccinia poae-nemoralis* group, e.g. *P. montanensis* Ell.

Kuehneola loeseneriana (*Arth.*) *Jacks. & Holw.* (syn. [*Uredo loeseneriana* P. Henn.], *Spirechina loeseneriana* Arth.)

On *Rubus* sp. Mérida: Sierra Nevada, La Mucuy near Tabay, 2500 m. Aug. 6 (2175). II + III.

This rust is widespread in the American tropics but appears to be new to Venezuela.

Mainsia jeffersii *Jørst.*, sp. nov. (Syn. [*Uredo jeffersii* Cumm.])

Uredosoris amphigenis vel hypophyllis, intraepidermalibus, 0·1–0·5 mm. diam., flavido-brunneis, pulverulentis. Uredosporis ellipsoideis, obovatis vel pyriformibus, 29–36 (39) × 16–26 μ, episporio hyalino, modice verrucoso-echinulato, 1·5–2·5 μ crasso, apice usque 10 μ incrassato, poris germinationis obscuris. Teleutosoris hypophyllis, subepidermalibus, rotundatis usque 0·7 mm. diam., pulvinatis, flavidis, paraphysibus nullis. Teleutosporis oblongo-ellipsoideis vel clavatis, apice rotundatis, basi attenuatis, 59–81 × 13–19 (22) μ, episporio hyalino, levi, 1–1·5 μ crasso, prope poro usque 2·5 μ incrassato; pedicello hyalino, fragili, usque 40 μ longo.

On *Rubus* sp. Miranda: La Silla above Los Palos Grandes (Caracas), 1400 m. July 13 (1661). II.—Mérida: Ejido road S. of Mérida, 1600 m. July 17 (1833). II; Sierra Nevada, La Mucuy, 2200 m. Aug. 6 (2177), II + III. *Type*.

In No. 1661 the uredospores measured 26–32 × 16–27 μ, and in No. 1833 27–42 × 19–23 μ.

Uredo jeffersii was recently described by Cummins (1952 p. 231) from the vicinity of Mérida in Venezuela, on *Rubus* sp. But probably it was the same Venezuelean rust of which Kern, Thurston & Whetzel (1934 p. 271, under *Mainsia mayorii* Jacks.) write that 'there is a greater tendency toward an apical thickening of the uredospores than we had considered typical' [i.e. for *M. mayorii*]. As a matter of fact, the present rust seems to be very near the latter species, in which however the uredospores are 'occasionally thickened slightly at the apex to 3–3·5 μ' (Jackson, 1931 p. 113).

Maravalia elata (*Syd.*) *Mains* (syn. *Uromyces elatus* Syd.)

On *Lupinus* sp. Mérida: Sierra de Santo Domingo, second Corrie, S. of Mucubaji. 3700 m. July 25 (2496). 0 + I.

Aecidia amphigenous, up to 1·3 mm. broad, hemisphaerical, opening by a pore; aecidiospores 19–36 × 19–26 μ, with 2–2·5 μ thick, finely verrucose wall. This rust species was hitherto known from Bolivia and Peru, on various species of *Lupinus*.

Milesia australis *Arth. ex Faull.*

On *Blechnum occidentale* L. Mérida: path to Rio Chama, 1500 m. July 20 (1822). II.

Uredospores 23–35 × 15–20μ, delicately echinulate, wall c. 1·5μ thick; they correspond to forma *irregularis* Faull. The rust was previously reported from Venezuela (Kern & Whetzel, 1943 p. 437) on *Bl. fraxineum* Willd. and *Bl. occidentale* L.

Phakopsora meibomiae (*Arth.*) *Arth.*

On *Desmodium* sp. Mérida: path to Rio Chama, 1500 m. July 20 (1826). II.

Apparently this chiefly West Indian rust species has not previouslv been reported from Venezuela.

Puccinia arechavaletae *Speg.*

On *Cardiospermum* cf. *grandiflorum* Sw. Distr. Federal: Chichiriviche, near sea-level, July 6 (1494). III.

The rust was previously reported from Venezuela, e.g. on species of *Cardiospermum*, but not on *C. grandiflorum*.

Puccinia caeomatiformis *Lagh.*

On *Baccharis* sp. Mérida: Sierra Nevada, La Mucuy near Tabay, 2000 m. Aug. 4 (1854). III.

The most common host of this rust species is *B. floribunda* H.B.K., and *B. polyantha* H.B.K. It has previously been found in Venezuela on the former host and on *B.* aff. *trinervi* (Lam.) Pers.

Puccinia caleae *Arth.*

On ? *Calea* sp. Mérida: Sierra Nevada, La Mucuy near Tabay, 2000 m. Aug. 4 (2170). II.

Uredospores 27–30 × 23–26μ, with 2 equatorial germ-pores and 1·5–2·5μ thick wall. This fits well the original description by Arthur (1905 p. 201) of *P. caleae*, on species of *Calea* in Mexico (uredospore size given as 24–30 × 20–24μ, wall thickness 1·5–2μ). However, what is considered the same species has often somewhat larger uredospores. *P. caleae* was not previously known from Venezuela.

Puccinia claviformis *Lagh.* (syn. *P. huallagensis* P. Henn., *P. solanicola* Mayor, *P. solanita* Arth.)

On *Solanum* sp. Miranda: Cortada del Guayabo, watershed between Rio Guaire and Rio Tuy, July 9 (2245). III.

Teleutospores 34–48 × 19–25μ, wall 1·5–2μ thick, not or slightly thickened at apex.

Puccinia crassipes *Berk. & Curt.*

On *Ipomoea* sp. Distr. Federal: Chichiriviche, July 6 (1485). I.

Spermogonia not seen. Outer wall of peridial cells 2–3μ thick, smooth or finely transversely striate, inner wall 2·5–4μ thick, coarsely verrucose.

Aecidiospores 15–22 × 13–19 μ, with c. 1 μ thick, finely verrucose wall. It seems better to place this aecidial stage with *P. crassipes* than with *Aecidium belizense* Mains from British Honduras, although the latter possesses quite similar aecidiospores, while they appear to be on an average somewhat larger in *P. crassipes*. However, the peridial cells in the present find correspond better with those in *P. crassipes*, and besides, *Ae. belizense* is accompanied by spermogonia. *P. crassipes* was previously reported from Venezuela on *Ipomoea* sp.

Puccinia cyperi *Arth.*

On *Erigeron floribundum* (H. B. K.) Sch. Bip. Distr. Federal: El Avila, near Hotel Humboldt, 2100 m. July 4 (2209A). 0 + I.

Aecidiospore wall thickened above, up to 8 μ. *P. cyperi* was previously reported from Venezuela on *Cyperus* sp. *Erigeron floribundum* is a new aecidial host of the rust.

Puccinia drabae *Rud.*

On *Draba cleiranthoïdes* Hook. f. var. *leiocarpa* O. E. Schulz. Mérida: Sierra de Santo Domingo, S. of Mucubaji, above 4000 m. Aug. 3 (2162A). III.

This largely arctic and circumboreal alpine rust has previously been found in South America in the Argentine province Mendoza, viz. on *Draba gilliesii* H. & A. and *Thlaspi conmutatum* (Lindquist, 1951 p. 77 and 1952 p. 217). *P. thlaspeos-glaucophylli* P. Henn. on *Th. glaucophyllum* Bon. in the mountains of Chile may be also identical with it according to Lindquist. *Dr. cheiranthoïdes* is a new host.

Puccinia ecuadoriensis *Arth.*

On *Wedelia* sp., probably *W. fruticosa* Turcz. Distr. Federal: Chichiriviche, 50 m. July 6 (2211). II.

Uredospores mostly globoid or subgloboid, 23–31 × 23–27 μ, sometimes broader than high, with 1·5–2·5 μ thick wall and several (up to 6) scattered germ-pores. This fits well the description of the uredo-stage in *P. ecuadoriensis*, but there is also some resemblance to the uredo-stage of *P. obrepta* Jacks. & Holw. *P. ecuadoriensis* has only been reported from Ecuador, viz. on *Wedelia* sp., and *P. obrepta* from Bolivia and Brazil, viz. on a couple of species of *Wedelia*.

Puccinia heliconiae *Arth.* (syn. *Uredo heliconiae* Diet.)

On *Heliconia* sp. Miranda: Guatopo, 800 m. June 26 (1483). II.

Apparently not previously reported from Venezuela.

Puccinia holwayula *Jacks.* (syn. *P. oyedaeae* Arth., non Mayor)

On *Oyedaea verbesinoïdes* DC. Distr. Federal: El Avila, 2000 m. Aug. 17 (2009). 0 + I + II.

On *Oyedaea* sp. Mérida: Rio Chama valley, opposite Mérida, 1600 m. July 20 (1848). 0 + I + II + III.

Uredospores globoid, 25–28 μ in diam., with several scattered germ-pores and 2·5–3·5 μ thick wall. Previously reported from Venezuela on *O. verbesinoïdes*.

Puccinia hydrocotyles *Cke.*

On *Hydrocotyle mexicana* Ch. & Schl. Mérida: Sierra Nevada, above La Mucuy, Tabay, 2600 m. Aug. 6 (2176A). II.

Uredosori epiphyllous. Apparently not previously reported on this host from Venezuela.

Puccinia infuscans *Arth. & Holw.*

On *Botriochloa saccharoides* (Sw.) Rydb. Distr. Federal: NW. ridge of El Avila, S. of La Guaira, Aug. 23 (2357). II.

Uredospores globoid or obovoid, 23–27 × 20–23 μ, wall uniformly (2) 2·5–4 μ thick, with mostly 5 germ-pores, thereof 4 more or less equatorial and one located near the apex. *P. infuscans* was previously known on this host from Guatemala, and on *B. perforata* (Fourn.) Hert. from Mexico. The present find seems to correspond better with this rust species than with *P. versicolor* Diet. & Holw., which is reported on the same host from Bolivia and in which the uredospores are usually more thick-walled and possess a larger number of pores, which are scattered.

Puccinia kyllingiae-brevifoliae *Miura* (syn. [*Uredo kyllingiae* P. Henn.], *U. kyllingiae-brevifoliae* Diet.)

On *Kyllinga brevifolia* Rottb. Mérida: Sierra Nevada, La Mucuy, 2000 m. Aug. 4 (1847). II.

Uredospores with 2–4 equatorial germ-pores. Not previously reported on this host from Venezuela. This rust closely resembles *P. cyperi* Arth., with which it is united by some authors.

Puccinia lantanae *Farl.*

On *Lantana* sp. Distr. Federal: Caracas, Botanic Garden, host apparently native, Aug. 20 (2016). III. Mesospores dominated.

Puccinia lateritia *Berk. & Curt.*

On *Borreria laevis* (Lam.) Griseb. Mérida: Rio Chama valley, 1500 m. July 7 (1825). III.

On *Borreria* sp. Distr. Federal: Chichiriviche, 400 m. July 6 (1478).

Earlier reported from Venezuela on *B. laevis.*

Puccinia levis (*Sacc. & Biz.*) *P. Magn.*

On *Thrasya* sp. Miranda: slopes of La Silla above Los Palos Grandes, 1200 m. Aug. 24 (2363). II.

Uredospores 23–28 × 18–23 μ, with c. 1·5 μ thick wall and 2 equatorial germ-pores. *P. levis* was previously reported from Venezuela on two species of *Paspalum.* It seems that the only record of this rust having been found on *Thrasya* is from British Honduras by Mains (1939 p. 12), viz. on *Thrasya campylostachya* (Hack.) Chase.

Puccinia liabi *Mayor*

On *Liabum* sp. Mérida: Sierra Nevada, above La Mucuy, 2500 m. Aug. 6 (1843). III.

The teleutospores had germinated. This rust species seems to be new to Venezuela.

Puccinia melampodii *Diet. & Holw.*

On *Eleutheranthera ruderalis* (Sw.) Sch. Bip. Distr. Federal: Caracas, Botanic Garden, June 30 (1492); Chichiriviche, July 6 (1496). III.

On *Elvira biflora* (L.) DC. Miranda: St. Eduviges (Caracas), 950 m. June 15 (1481). III.

On *Milleria quinqueflora* L. Mérida: hills on the NW. side of Mérida, 1600 m. July 17 (1690). III.

The rust was previously reported from Venezuela on *Eleutheranthera ruderalis* and *Synedrella nodiflora* (L.) Gaertn. It seems that it previously has not been reported for members of the genera *Elvira* and *Milleria*.

Puccinia oliganthicola *Jørst.*, sp. nov. (syn. [*Uredo paraphysata* Kern & Thurst.], non = *P. pataphysata* Reichert)

Uredosoris hypophyllis, cinnamomeo- vel castaneo-brunneis, rotundatis, 0·1–0·4 μ latis, pulverulentis, epidermide rupta conspicua; paraphysibus copiosis, clavatis vel cylindraceis, erectis vel incurvatis, usque 80 μ longis et supra 9–26 μ latis, membrana 1 μ crassa, supra non vel leniter ad 3 μ incrassata fere hyalina vel cinnamomea-brunnea. Uredosporis subglobosis, ovoideis vel late ellipsoideis, 23–28 × 19–26 μ, episporio cinnamomeo-brunneo, 1·5–2·5 μ crasso, fortiter echinulato, poris germinationis 2, equatorialibus. Teleutosporis uredosororum immixtis vel in soris separatis uredosoris similibus, late ellipsoideis, 43–64 × 32–35 μ, utrinque rotundatis vel basi leniter attenuatis, medio conspique constrictis; episporio flavo-brunneo, 1–1·5 μ crasso sed supra in utrinque cellulis valde incrassato (in cellula superiore 12–17 μ), levi, poro superiore apicali, poro inferiore juxta septum; pedicello hyalino, deciduo, usque 50 μ longo. Fig. 2.

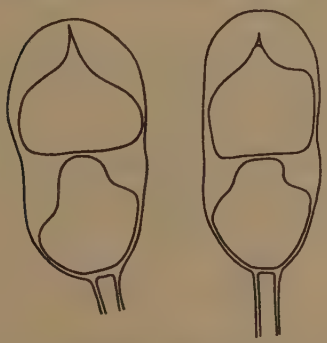

Fig. 2. *Puccinia oliganthicola* Jørst. sp. nov. Teleutospores, × 550.

On *Oliganthes* cf. *macrophylla* Sch. Bip. Distr. Federal: El Avila, in cloud forest, 2000 m. Aug. 23 (2360).

The uredo-stage is probably the same as *Uredo paraphysata* Kern & Thurst., described from Venezuela on *Oliganthes ? hypochlora* Blake. Even in *P. seaveriana* Arth., on *O. condensatus* (Less.) Sch. Bip. in Trinidad, the uredo-stage is of essentially similar type except that the spores are stated to have 3 equatorial pores. However, the teleutospores, of which Arthur found a few only, are quite different from those in *P. oliganthicola*, but similar to those of the supposed microform *P. puyana* Syd. on *O. discolor* Sch. Bip. in Ecuador.

Puccinia oxalidis *Diet. & Ell.*

On *Oxalis* sp. Mérida: Ejido road S. of Mérida, 1600 m. July 17 (1684). II.

Was previously reported from Venezuela on *Oxalis latifolia* H.B.K. and *Xanthoxalis* sp.

Puccinia pittieriana *P. Henn.*

On *Solanum colombianum* Dun. subsp. *otites* (Dun.) Hawkes. Mérida: Sierra de Santo Domingo, Laguna Negra, 3440 m., July 31 (2497). III. On a dwarf potato species.

This American potato-rust was previously reported from Venezuela, viz. on *Solanum* sp. (wild potato), by Kern, Thurston & Whetzel (1934 p. 285). *P. aulica* Jacks. & Holw., on *S. montanum* L. in Ecuador, seems hardly different.

Puccinia poae-nemoralis *Otth* (Syn. *P. poae-sudeticae* [West.] Jørst.)

On *Hierochloë* sp. Mérida: Sierra Nevada, at Laguna de Coromoto, 3400 m., Aug. 7 (2191A).

Uredosori amphigenous with numerous hyaline, capitate paraphyses of the usual *P. poae-nemoralis* type, viz. mostly more or less bent or incurved and with a distinct 'neck'; heads 13–19 μ broad with up to 5·5 μ thick wall. Uredospores 25–37 × 18–24 μ, with 1·5–2 (2·5) μ thick wall and about 8 scattered germ-pores. This grass-rust was not previously reported on *Hierochloë*, and it is new to Venezuela. From the island Chiloe in Chile Arentsen (1947 p. 45) has described and illustrated a paraphysate uredoform on *Hierochloë* sp., but it differs from the present specimen in having much larger uredospores with 5 germ-pores only.

Puccinia posadensis *Sacc. & Trott.* (Syn. *P. kaernbachii* Arth. & Fromme)

On *Schizachyrium* (*Andropogon*) sp. Distr. Federal: NW. ridge of El Avila, S. of La Guaira, 1800 m. Aug. 23 (2358). II.

Uredoparaphyses capitate, thick-walled, hyaline or light brown; uredospores brown, with 4 equatorial germ-pores. This widespread American rust was previously reported from Venezuela, viz. on *Andropogon* sp. (Kern & Thurston, 1943 p. 440) and *Andr. condensatus* (Nees) Kunth (Cummins, 1953 p. 22).

Puccinia pulverulenta *Grev.* (syn. *P. epilobii-tetragoni* Wint., *P. vagans* Arth.)

On *Epilobium meridense* Hsskn. Mérida: Sierra de Santo Domingo, Mucubaji lake, 3550 m. July 23 (2059A). I.

Spermogonia appear to be absent, which however is quite common in this rust species. The host is new, and the rust seems to be new to Venezuela.

Puccinia ruizensis *Mayor* (syn. *P. hunzikeri* Lindq.)

On *Oreomyrrhis andicola* (H.B.K.) Endl. Mérida: Sierra de Santo Domingo, Laguna de Canoa, 3460 m. July 30 (1845). II.

The rust is new to Venezuela.

Puccinia saltensis *Cumm.*

On ?*Stipa* sp. Mérida: Sierra de Santo Domingo, between Barinas and Apartaderos, road to Hacienda La Corcovada, 3000 m. July 29 (1864). II.

Uredosori epiphyllous, invisible when dry as the linear leaves are wholly involute, with numerous, mostly straight, capitate, hyaline paraphyses, usually without distinct 'neck', heads 13–19 μ broad with uniform 1·5–3 μ thick wall. Uredospores 19–26 × 15–20 μ with 1·5–2 μ thick wall and c. 6 scattered germ-pores.

It seems that this rust is best placed with *P. saltensis*, viz. with the var. *saltensis* (cf. Greene & Cummins, 1958 p. 9), although the paraphysis wall is thinner than described for this species. It is new to Venezuela.

Puccinia spegazzinii *De-Toni.*

On *Mikania micrantha* H.B.K. Miranda: Guatopo, beside Araguita road, 750 m. June 24 (2230). III.

Teleutospores 45–58 × 12–17 μ.

Puccinia substriata *Ell. & Barth.*

On ?*Paspalum* sp. Miranda: La Silla above Los Palos Grandes (Caracas), Aug. 24 (2350). II.

Puccinia thaliae *Diet.* (syn. [*Uredo cannae* Wint.]. *Puccinia cannae* P. Henn.).

On *Canna indica* L. Distr. Federal: Chichiriviche, near sea-level, July 6 (2491). II; Caracas, Plaza Morelos, 920 m. Aug. 10 (2492). II.

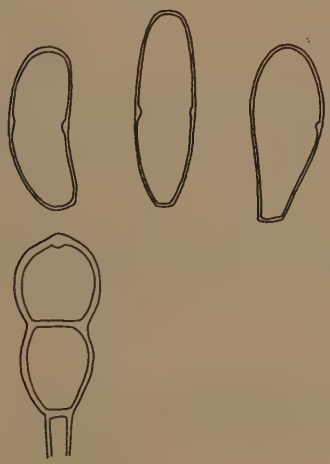

FIG. 3. *Puccinia unciniae* Jørst. sp. nov. Teleutospores and 3 amphispores, × 550.

Puccinia unciniae, *Jørst.*, sp. nov.

Soris hypophyllis, 0·2–0·6 mm. longis, brunneis, diu epidermide tectis, amphisporis et teleutosporis comprehendibus. Amphisporis clavulatis vel anguste ellipsoideis, (31) 35–52 × 13–19 μ, episporio hyalino, 1 μ crasso, subtilissime et vix visibile echinulato, poris germinationis equatorialibus,

obscuris, evidenter 2; pedicello brevissimo. Teleutosporis clavatis, apice rotundatis, infra leniter attenuatis, medio fortiter constrictis, 42–55 × 19–23 μ episporio flave-brunneo, 1·5–2·5 μ crasso, apice non vel vix (usque 3 μ) incrassato, levi, poro superiore ad apicem, poro inferiore juxta septum; pedicello hyalino, brevi. Fig. 3, p. 55.

On *Uncinia meridense* Steyerm. Mérida: Sierra de Santo Domingo, Corrie S. of Mucubaji, 3600 m. July 24 (1863).

In some of the sori teleutospores predominated, in others amphispores. The rust is widely different from *P. uncinearum* Diet. & Neg.

Puccinia cf. **unicolor** *Arth.*

On *Baccharis* sp. Mérida: Sierra de Santo Domingo, Laguna Negra, mouth of the Corrie, 3440 m. July 31 (2129). o + I.

Spermogonia epiphyllous. Aecidia hypophyllous, of *Eriosporangium* type (without peridium); aecidiospores subglobose or oblong, sometimes pointed at one or both ends, 27–45 × 20–28 μ, wall 1·5–2·5 μ thick, finely verrucose and often with longitudinal lines.

P. unicolor was described from Peru (type host *Baccharis hemiprionides* Bak.) and was later reported for one more host species in Peru and for another in Bolivia, in the last-mentioned instance by Jackson (1932 p. 155) who described the aecidial stage. Of the numerous rust species on *Baccharis*, *P. unicolor* seems to fit the present aecidial stage best.

Pucciniosira eupatorii *Lagh.*

On *Eupatorium* sp. Mérida: Sierra de Santo Domingo, Laguna Negra, mouth of the Corrie, 3440 m. Aug. 1 (2132). III.

Appears to be new to Venezuela.

Pucciniosira pallidula (*Speg.*) *Lagh.*

On *Triumfetta* sp. Distr. Federal: Chichiriviche, July 6 (2210). o + III.

On '*Malvales*' (probably *Triumfetta* sp.). Mérida: Rio Chama valley, 1550 m. July 20 (1674A). o + III.

This rust is widespread in tropical America on species of *Triumfetta*, and is also recorded for *Heliocarpus* (both genera belonging to *Tiliaceae*), further by Mayor (1913 p. 549) from Colombia on the Malvaceous species *Pavonia paniculata* Cav. It was previously reported from Venezuela on *Triumfetta semitriloba* Jacq.

Sphenospora kevorkianii *Linder*

On *Epidendrum* sp. Distr. Federal: El Avila, 2000 m. July 4 (1484). II.

Uredosori long covered by the blackish epidermis, hemisphaerical, later erumpent. Uredospores 25–35 × 21–25 μ, wall 1·5–2·5 μ thick, with 2 rather obscure, equatorial germ-pores.

This find could equally well be placed with *Uredo epidendri* P. Henn. when the latter is taken in the same broad sense as by H. Sydow (1939 p. 326). He placed *Uredo guacae* Mayor with *U. epidedri*, maintaining that there are no real differences between them and that both belong to one and the same variable species. It does not seem unlikely that *U. epidendri* s. lat. belongs to

Sphenospora kevorkianii. Both *U. epidendri* and *U. guacae* are reported as having been intercepted in U.S.A., e.g. on species of *Epidendrum* imported from Venezuela.

Uredo hypoxidis (*Bres.*) *P. Henn.*

On *Hypoxis decumbens* L. Mérida: Sierra Nevada, Mucuy near Tabay, 2000 m. Aug. 4 (1846).

This common rust in the American tropics, with *H. decumbens* as the chief host, does not seem to have previously been reported from Venezuela. It has partially been confused with the North American *Uromyces affinis* Wint., which, however, according to Cummins (1941, p. 47), appears to be an opsisform lacking uredo.

Uredo monochaeti *Kern & Thurst.*

On *Monochaetum meridense* (Karst.) Kl. & Naud. Mérida: Sierra Nevada, La Mucuy near Tabay, 2000 m. Aug. 4. (2167).

This rust was described from Venezuela, on *M. hirtum* (Karst.) Triana (Kern & Thurston, 1944 p. 63); it has later been reported from Guatemala and El Salvador, on two species of *Heterocentron* (Cummins & Stevenson, 1956 p. 180).

Uredo polylepidis (*Arth.*) *Sacc. & Trott.* (syn. *Frommea polylepidis* Arth.)

On *Polylepis sericea* Wedd. Mérida: Sierra de Santo Domingo, Laguna Negra, 3440 m. July 28 (1855).

Uredo sp.

On *Salvia palifolia* H.B.K. Mérida: Sierra Nevada, La Mucuy near Tabay, 2000 m. Aug. 4 (1851).

Uredospores 26–33 × 20–26 μ, with 1·5–2 μ thick wall and 2 mostly infra-equatorial germ-pores; they approach the type 3 of Baxter & Cummins (1952 p. 203). As teleutospores are not present the rust cannot be determined as to species. Apparently no rust has previously been recorded on the present host.

Uredo sp.

On *Poa* sp. Mérida: Crest of Sierra de Santo Domingo, S. of Mucubaji, 4000 m. Aug. 3 (2163).

Uredosori epiphyllous, in part infected with *Darluca filum*. Uredospores 23–34 × 18–23 μ, wall c. 1·5 μ thick, with 7–8 scattered germ-pores, minutely echinulate. Where to place this uredo-stage is uncertain.

Uromyces appendiculatus (*Pers.*) *Ung.* (syn. *Ur. phaseoli* (Pers.) Wint.)

On *Phaseolus* sp. (cult.). Distr. Federal: El Avila, 1900 m. Aug. 17 (2693). II.

Previously reported from Venezuela on *Ph. vulgaris* L.

Uromyces bidenticola *Arth.* (syn. [*Uredo bidenticola* P. Henn.]).

On *Bidens* sp. Miranda: Cortada del Guayabo, watershed between Rio Guaire and Rio Tuy, July 9 (2244). 0 + I + III.

Earlier reported from Venezuela on *B. pilosa* L.

Uromyces commelinae *Cke.* (syn. *Uredo commelinae* Speg.)

On *Tripogandra multiflora* (Sw.) Raf. (syn. *Tradescantia multiflora* Sw.). Mérida: Sierra Nevada, above La Mucuy, near Tabay, 2000 m. Aug. 4 (2171). II.

Not previously reported on this host from Venezuela.

Uromyces euphorbiae *Cke. & Peck* (syn. *Urom. proëminens* Pass., *Urom. euphorbiïcola* Tranz.).

On *Euphorbia hirta* L. Miranda: Guatopo, between Ocumar del Tuy and Altagracea, 850 m. June 27 (1482). II; Distr. Federal: Caracas, Botanic Garden, June 19 (1493). II.

Uromyces imperfectus *Arth.* (syn. *Urom. bauhineae* Vestergr., non P. Henn.)

On *Bauhinia* sp. Miranda: Cortada del Guayabo, watershed between Rio Guaire and Rio Tuy, 1400 m. July 9 (1499). 0 + II.

Spermogonia epiphyllous, 70–100 μ broad, surrounded by primary uredosori. Uredospores 23–28 × 20–25 μ, with 2 or mostly 3 equatorial germ-pores, wall 1·5–2·5 μ thick, strongly and sparsely aculeate. It seems that spermogonia have not previously been mentioned for this species.

Uromyces ratoïdes *Jørst.*

On *Cucurbitaceae*. Mérida: Sierra Nevada, above La Mucuy near Tabay, 2600 m. Aug. 6 (2173A). 0 + II + III; La Mucuy, 2000 m. Aug. 4 (1844). II + III.

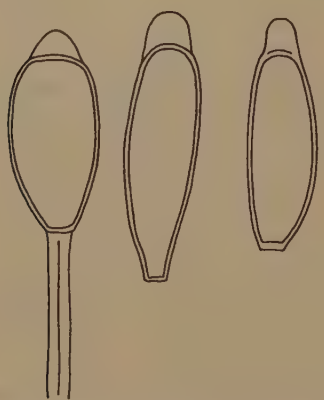

Fig. 4. *Uromyces ratoïdes* Jørst. Teleutospores from No. 2173A, × 550.

The two finds are not quite similar. No. 2173A shows epiphyllous spermogonia surrounded by mostly epiphyllous primary uredosori, also hypophyllous teleutosori. The uredospores are subglobose, obovate, broadly ellipsoid or somewhat triangulate, 33–40 × 28–32 μ, with 1·5–3 μ thick wall with 2 approximately equatorial germ-pores. The teleutospores are fusiform or ellipsoid, 39–80 × 16–33 μ, including an apical papilla up to 10 μ high. No. 1844 contains hypophyllous teleutosori and a little uredo (uredospores partially intermixed in the teleutosori, partially in separate sori). Uredo-

spores mostly triangulate, 25–32 × 24–27 μ, with c. 1·5 μ thick wall and 2 subequatorial or approximately equatorial germ-pores. Teleutospores very variable, obovate, ellipsoid or fusiform, 29–61 × 15–28 μ, with apical papilla up to 12 μ high. While No. 2173A corresponds fairly well with *Urom. ratoides* on *Cucurbitaceae* in Ecuador (cf. Jørstad, 1956 p. 479), No. 1844 apparently approaches *Urom. ratus* Jacks. & Holw. on species of *Cayaponia* in Brazil. According to Jackson (1932 p. 102) the uredospores in this rust are often triangulate, 27–32 × 22–27 μ, and the teleutospores subglobose or ellipsoid, 27–38 × 24–27 μ, thus more uniform and on an average considerably shorter than in No. 1844. Fig. 4.

From Venezuela there was previously reported *Urom. hellerianus* Arth. on *Melothria* aff. *guadelupensi* (Spreng.) Cogn. (Kern & Thurston 1944 p. 64). This rust does not seem to differ essentially from *Urom. novissimus* Speg.; both live e.g. on species of *Cayaponia* and they are undoubtedly both closely allied to *Urom. ratus*.

Appendix

Bubakia argentinensis (*Speg.*) *Jacks. & Holw.* (syn. [*Uredo crotonicola* P. Henn.] *Melampsora argentinensis* Speg., *Phakopsora crotonicola* Kern, Thurst. & Whetz.).

On *Croton niveus* Jacq. Martinique. S. of Grande Anse (West coast). Aug. 28 (2361). II.

Uredospores 17–22 × 13–17 μ, wall in some spores thickened at apex. This rust is chiefly known from the South American continent, but is also reported from Trinidad, viz. on *Cr. hirtus* L'Hér. *Cr. niveus* appears to be a new host.

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Minor elements and plant growth.*—This publication surveys those elements essential to plant nutrition (except nitrogen, phosphorus, potassium, calcium, magnesium and sulphur) which are classed as 'major' nutrients. As the title suggests, the author is mainly concerned with the *Gramineae* and *Leguminosae*, and the work will be of great value to agronomists. There is an extensive bibliography and a useful appendix giving the element-contents in parts per million of dry matter for 17 genera and 27 species, together with sources of the data.

The author's statement that there is no evidence of the production of ill effects in plants from radio-active fall-out seems over-optimistic in view of some recent literature.

The problem of toxicity of metals is particularly relevant today, and Dr. Williams discusses the alleviation of both excesses and deficiencies.

M. Y. Stant

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* *Minor elements and their effects on the growth and chemical composition of herbage plants.* By R. D. Williams. Pp. 68 (mimeographed). Farnham Royal: Commonwealth Agricultural Bureaux, 1959. Price 7/6.

Nomenclatural notes: XIII*

L'ARTICLE 57 DU CODE DE NOMENCLATURE ET LE CAS DE SAPIUM RETICULATUM (EUPHORBIACÉE AFRICAINE)

J. Léonard (I.N.E.A.C., Bruxelles)

Sapium reticulatum (*Hochst. ex Krauss*) *Pax* est une euphorbiacée africaine dont le basionyme, *Sclerocroton reticulatus* Hochst., a été publié par Krauss en 1845 en même temps qu'une autre espèce nouvelle du même genre, *Sclerocroton integerrimus* Hochst. ex Krauss.

De l'avis de tous les spécialistes qui les ont étudiées (Baillon, Müller d'Argovie, Pax et K. Hoffmann, Prain), et c'est également le nôtre, les 2 espèces précitées de *Sclerocroton* sont identiques.

Baillon, le premier, les considéra comme synonymes, choisit l'épithète *integerrimus* et, estimant ces espèces mieux placées en *Stillingia*, publia la combinaison *Stillingia integerrima*.

Müller d'Argovie, préférant placer ces 2 *Sclerocroton* dans le genre *Excoecaria*, les réunit tout d'abord sous le nouveau nom d'*Excoecaria hochstetteriana*. Changeant d'avis quelques années plus tard, il publia le nom (nomen nudum) d'*Excoecaria integerrima*, puis adopta finalement celui d'*Excoecaria reticulata*.

Pax et K. Hoffmann, ainsi que Prain qui résuma clairement le problème, firent cette fois passer ces 2 *Sclerocroton* en *Sapium* sous le nom de *Sapium reticulatum*.

On voit donc que, contrairement à Baillon, ses successeurs, en la transférant dans d'autres genres, préférèrent l'épithète *reticulatus* à celle d'*integerrimus*, pourtant choisie en premier lieu par Baillon.

La seconde phrase de l'article 57 du code de nomenclature adopté à Paris en 1954 stipule 'L'auteur qui, le premier, unit des taxa portant des noms ou des épithètes de même date, a le droit de choisir parmi ceux-ci et son choix fait autorité'.

Ce texte ne dit pas d'une manière explicite si le choix du premier auteur fait également autorité au cas où les épithètes spécifiques sont transférées dans d'autres genres.

Néanmoins, d'après l'esprit de l'article 57, il nous semble bien que, dans l'exemple précité des *Sapium*, l'épithète *integerrimus*, adoptée en premier lieu par Baillon, doit être préférée à celle de *reticulatus*.

Aussi, dans un but de plus grande clarté, suggérons-nous qu'à l'article 57, après le mot 'autorité', soit ajouté: "; pour les taxa de rang inférieur au genre, son choix fait autorité quel que soit le genre ou l'espèce auquel on rattache le taxon choisi."

Au cas où cette précision paraîtrait réellement superflue, nous suggérons, toujours dans le même but de plus grande clarté, qu'un exemple du genre de celui mentionné ici soit ajouté à la liste des exemples accompagnant l'article 57.

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* Continued from Kew Bull. **14**, 45 (1960)

L'exemple invoqué peut, dès lors, se résumer comme suit:

Sapium integerrimum (*Hochst. ex Krauss*) *J. Léonard* in Bull. Jard. Bot. Brux. **29**, 142 (1959)

Sclerocroton integerrimus Hochst. ex Krauss in Flora **28**, 85 (1845)

Tragia integerrima Hochst. ex Krauss in Flora **28**, 85 (1845), *pro synon.*

Sclerocroton reticulatus Hochst. ex Krauss in Flora **28**, 85 (1845)

Tragia natalensis Hochst. ex Krauss in Flora **28**, 85 (1845), *pro synon.*

Stillingia interrima (Hochst. ex Krauss) Baill. in Adansonia **3**, 162 (1862–1863)

Excoecaria hochstetteriana Müll. Arg. in Linnaea **32**, 122 (1863)

Excoecaria integerrima (Hochst. ex Krauss) Müll. Arg. in DC., Prodr. **15(2)**, 948 (1866)

Excoecaria reticulata (Hochst. ex Krauss) Müll. Arg. in DC., Prodr. **15(2)**, 1213 (1866)

Sapium reticulatum (Hochst. ex Krauss) Pax in Engl., Pflanzenr. IV. **147**(5), 245, fig. 46 C–D (1912); Prain in Dyer, Fl. Cap. **5(2)**, 514 (1920)

Mozambique: Delagoa Bay, *Junod* s.n. (BR), 68 (K); Magaia, *Schlechter* 12046 (BR); Massinga, *Gomes e Sousa* 1727 (BR, K); Sul do Save, Panda, *Exell, Mendonça & Wild* 604 (BM).

Natal: in woods, *Krauss* 351 (isotype de *Sclerocroton integerrimus*; BM, K,), 468 (isotype de *Sclerocroton reticulatus*; BM, K,); Mtubatuba, *Codd* 2033 (K).

Flowering succulents.*—This is a small pocket-book, illustrated in colour, of a mere 80 pages, intended as an introduction to the cultivation and literature of succulent plants. There is a short section on the nomenclature of plants, in which only one error calls for comment. The 'specific name' in the table at the top of p. 18 should read 'specific epithet'. The author also has indicated that the 'International Code of Botanical Nomenclature' has some legal authority. This is far from true; it is a code of expediency, not of either law or justice.

It is to be hoped that readers will duly note the advice given on p. 21 '4. Do **not** write to a specialist or to Kew, ... ' For the rest, the facts and instructions given are accurate and sound and the book is perhaps one of the best on this topic within its own field that has appeared in recent years. It makes no pretence to be a complete manual, but gives a series of references (pp. 72–75) to other works and a very useful combined glossary and index (pp. 76–80).

The coloured photographs are not, perhaps, of the best quality, but these with the black and white photographs and line drawings, are adequate. The type is clear and easy to read and there are few, if any, printers' errors.

A. A. Bullock

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* *Flowering Succulents*. By G. Rowley. Pp. 80, 10 colour plates, 6 half-tone plates, 7 figures. Farnham: Living Colour Publications Ltd., 1959. Price 7/6d.

On the identity and nomenclature of *Galium erectum* Huds.

H. K. Airy Shaw

It has been found that the name *Galium erectum* Huds. is untenable in its current application, and the present note seeks to set out the circumstances.

Briefly stated, the nomenclatural position in regard to *Galium erectum* Huds. turns out to be strictly parallel to that involving *Trifolium procumbens* L. The *T. procumbens* of the second edition of Linnaeus' 'Species Plantarum' (1762) is an entirely different species from the *T. procumbens* of the first edition (1753). (Cf. Ascherson & Graebner, 1907, Syn. Mitteleur. Fl. **6**, II, 476–7). In the same way, the *Galium erectum* of the second (1778) edition of Hudson's 'Flora Anglica' proves to be quite a different species from the original *G. erectum* of the first (1762) edition. The name has been invariably used, and is unfortunately still being used, in the sense of Hudson's *second* edition.

A comparison of the two descriptions, and a consideration of the adjacent species in each case, will make this clear. In the *diagnoses*, the differing words have been here printed in s p a c e d type, in order to emphasize them more clearly.

Hudson, 1762, *Flora Anglica*, *ed.* 1, 56:—

'4. *uliginosum*. . . . . .

5. *erectum*. GALIUM foliis octonis g l a b r i s lanceolatis mucronatis, caule s u b e r e c t o, panicula t e r m i n a l i, p e d u n c u l i s d i c h o t o m i s.
Anglis, small mountain bastard Madder.
Habitat in pascuis montosis humidiusculis. 2|. VIII.

6. *pusillum* . . . . . .'

Hudson, 1778, *Flora Anglica*, *ed.* 2, 68:—

'4. *uliginosum* . . . . . .

5. *erectum*. GALIUM foliis s u b octonis lanceolatis a c u l e a t o-s e r r u l a t i s mucronatis, paniculis t r i c h o t o m i s, caule s c a b r o f l a c c i d o.
Galium austriacum *Jac. Fl. austr.* I. 51. t. 80.
Anglis, upright Ladies Bedstraw.
Habitat *in pratis et pascuis subhumidis*. 2|. VI. VII.
Desc. Radix *perennis ramosa*; Caules *plures flaccidi, erectiusculi, geniculati* : *geniculis tumidis* ; *quadranguli angulis scabriusculis* ; *parum hirsuti, ramosi, ramis oppositis floriferis*. Folia *verticillata, octona, subinde sena, sessilia lanceolata et linearilanceolata, aculeato-serrulata, mucronata, nuda*. Panicula *terminalis trichotoma*. Flores *albi quadrifidi*. Semina *glabra, parva*.

6. *Mollugo* . . . . . .

7. *pusillum* . . . . . .'

The altered application is evident from several points in these descriptions, but perhaps most strikingly from the English names, the habitats, the times of flowering, and the species placed immediately afterward in each case. It needs little labouring to see that the details given in ed. 1—'small', 'mountain', 'montosis', 'VIII', '*pusillum*'—can only apply to a (smooth-leaved) form of *Galium pumilum* Murr., perhaps var. *montanum* (Vill.) Hayek; while the particulars in ed. 2, including the early date of flowering, the insertion of *G. mollugo* between *G. erectum* and *G. pusillum*, and most of the long and detailed description, leave little room for doubt that this is indeed the plant we have all along known as '*Galium erectum*'.

It may well be surmised that Hudson, a native of Kendal in Westmorland, may not have become familiar with the more lowland and southerly '*G. erectum*' until after his removal to London in about 1750, and perhaps not even until after the publication of the first edition of his 'Flora' in 1762. According to Wilson, 1938, Fl. Westmorl. 155, '*G. erectum*' is a very rare species in that county, being known only from two localities in the extreme north-west and from railway banks in the extreme south-west—a circumstance suggesting introduction. Its low altitudinal range (20–500 feet, as given by Wilson) would, moreover, surely never have induced Hudson to call it the 'small *mountain* bastard Madder'. On the other hand, Hudson was certainly well acquainted with the variable *G. pumilum* (*vide* his '*G. pusillum*'), a species which, according to Wilson, is frequent in Westmorland on calcareous banks and limestone scars up to 2470 feet, and would well justify Hudson's English name for it. When he came to revise his flora for a second edition, he evidently decided that his original *G. erectum* was not a distinct species, and, instead of relegating it to the synonymy of his '*G. pusillum*', he quietly dropped it, without comment, and re-employed the epithet for the *G. mollugo* ally with which he had by then become acquainted and which was without a specific name.

But this second '*G. erectum*' proves to be doubly untenable. Not only is it a later homonym (as is evidently the case; it cannot be regarded merely as an 'emendation' of the former species): it is also a superfluous name, since *Galium austriacum* Jacq. is cited as a direct synonym, and therefore *G. erectum* Huds. 1778 is an illegitimate re-naming of *G. austriacum* Jacq. 1773. Whether the two are in fact conspecific or not is beside the point; that will be in any case a matter of opinion only, and does not affect the nomenclatural point at issue. What does matter is that Hudson considered them conspecific, and should therefore have used Jacquin's name.

It is thus inescapable that a new name is required for *Galium erectum* Huds. 1778, non 1762, if given specific rank, since it is generally agreed that *G. austriacum* Jacq. represents a different species, belonging to the *G. pumilum* complex. The only possible available name that I have been able to discover is *Galium capsiriense* Jeanb. ex Timb.-Lagr. in 1883–4, Bull. Soc. Sci. phys. & nat. Toulouse **6**, 155. This is treated by Rouy & Foucaud, 1903, Fl. Fr. **8**, 15, as a synonym of *G. mollugo* ssp. *erectum* ('Huds.') R. et F. var. γ *scabridulum* Rouy. By the courtesy of the authorities in charge of the Toulouse herbarium, the type of *G. capsiriense* has been sent on loan to Kew for examination, and has proved, as expected, to represent a form certainly coming within the ambit of what we call *Galium erectum* in this country. A

Plate 3

Galium capsiriense Jeanb. ex Timb.-Lagr. Photograph of type-specimen at Toulouse. (France: Pyrenées orientales.)

[*To face page* 64

photograph of the type is reproduced herewith (Plate 3). The correct name, then, for *Galium erectum* Huds. 1778, non 1762, maintaining it in the rank of a species, appears to be **Galium capsiriense** *Jeanbert ex Timbal-Lagrave*, 1883.

As stated by Clapham, however, in Clapham, Tutin & Warburg, 1952, Fl. Brit. Isles, 992, *G.* '*erectum*' and *G. mollugo* L. are sometimes regarded —as for instance by Syme in Sowerby, 1865, Engl. Bot., ed. 3, **4**, 217, by continental authorities, and by Dandy, 1958, List Brit. Vasc. Pl. 108—as subspecies of a single species, for which there is certainly a case. If this is done, no nomenclatural problem arises, since the taxon can quite legitimately be referred to as *Galium mollugo* L. subsp. *erectum* Syme. It is, however, clear that the status of the whole complex of forms included in *G. mollugo* L., *sensu latissimo*, is in urgent need of clarification, and until this is done there will almost certainly be some botanists who will feel that '*erectum*' is quite a 'good' species!

British trees and shrubs.*—Anyone interested in the shrubs and trees of the British countryside, both native and naturalized, will find R. D. Meikle's little book in the 'Kew series' most instructive and at the same time entertaining. It is well produced and, in addition to a number of excellent black and white illustrations, has some very fine coloured plates by Miss A. V. Webster, which combine botanical accuracy with artistic merit in a manner unusual in a book of this nature and which probably do justice to the original paintings.

The author starts by giving a most readable introduction in which he explains quite simply the botanical terms used in the descriptive part of the book, adding a short section dealing with Classification and Nomenclature. A key to the genera follows, and then each family, genus and species is shortly described in such a way as to emphasize their essential characters. The systematic arrangement is mainly that of Bentham and Hooker, slightly modified as a result of recent research.

So far, apart from the illustrations, there is nothing unusual about the book, but what makes it particularly attractive is the additional information which the author gives such as the derivation of the name, facts about plant-lore and historical and horticultural information. It is interesting, for instance, to learn that the Strawberry Tree (*Arbutus unedo*) was introduced into English gardens as early as A.D. 1568, and that the raw fruits of the Sea Buckthorn (*Hippophaë rhamnoïdes*) are so unpleasant that no one would think of eating them, though 'the Tartars' it is said made a jelly of them and the fishermen of the Gulf of Bothnia prepare from them a fish sauce! This book can be highly recommended to anyone interested in our native trees.

E. Milne-Redhead

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* *British Trees and Shrubs*. By R. D. Meikle, with colour illustrations by A. V. Webster and text illustrations by E. V. Petts, No. 2 of the Kew Series. Pp. 244, 15 plates and 84 figures. London: Eyre and Spottiswoode, 1958. Price 25/-.

A new species of *Cortinarius* from the Himalaya

MEINHARD MOSER (IMST)

Several years ago Dr. R. W. G. Dennis sent me a specimen of a *Cortinarius*, subgenus *Phlegmacium*, collected by Mr. K. Grinling near Mussoorie, U.P., India. Now, while preparing a monograph of the *Phlegmacia* of Central Europe, I have found an opportunity of making the necessary comparative studies and placing the fungus in question more precisely. It is to be regarded as a new species for which I propose the name *Cortinarius grinlingii*, in honour of the collector.

Cortinarius (Phlegmacium) grinlingii *Moser*, sp. nov.

Pileus 8–12 cm. latus, margine involuto, argillaceus, in vertice ochraceo-brunneus, demum pallide fulvus et obscuriore maculatus. Lamellae pallidae, demum cinnamomeae, confertae, adnato-emarginatae. Stipes cylindricus, marginato-bulbosus, robustus, 9–12 cm. longus, albidus et leviter lilacinus. Caro alba, pallide luteoviridis sub cuticulae et lilacina in apice stipitis. Sporae amygdaliformes vel sublimoniformes, verruculosae, 12–13 × 6·5–7 μ. Characteres chemici ignoti. Habitatio in silvis deciduis prope Mussoorie, U.P., India, 8.7.1950 leg. *K. Grinling*, holotypus in Herb. Kew.

Cap 8–12 cm., rather viscid, ochraceous-brown in the centre, clay-coloured towards the margin, becoming almost entirely red-brown with darker spots when old; margin incurved when young; peels. Gills crowded, adnate-emarginate, easily separable, brittle, thin, narrow, uniform in length, at first pallid, becoming cinnamon-coloured. Stem 9–12 cm. long, robust, thick, non-viscid, slightly flattened, with clearly marginate bulb and pronounced cortina; colour whitish with a lilaceous tint (almost greenish), smooth, satiny, slightly striate. Flesh whitish with a yellowish-green tinge under the cuticle, lilaceous in the stem. Spore print dark cinnamon, smell and taste unknown. Microscopic characters: spores amygdaliform to nearly lemon-shaped, 12–13 × 6·5–7 μ, coarsely granulate-warted, yellowish-brown; basidia 4-spored; cuticular hyphae 4–6 μ wide. Habitat probably deciduous forests.

Observations. The species seems somewhat intermediate in character between the *Rapaceus* and *Napus* series but I prefer to assign it to the former. It differs from *C. rapaceus* Fr. in the browner colour of the cap as well as in the larger size of fruitbodies and of spores. *C. rapaceus* may occasionally have bluish tints on the stem and in the flesh. *Cortinarius albidus* Peck has somewhat smaller spores of slightly different shape. In its typical American form it is more whitish and lacks the lilaceous-greenish tint on the stem, this holds also for the European subspecies in which, however, the cap becomes nearly reddish-brown with innate fibrils when old.

In the *Napus* series *C. grinlingii* comes closest to *C. corrosus* Fr. and *C. saporatus* Britz. It differs from the former in its larger spores and greater size; from the latter in the colour of the stem and in the habitat. On account of the more pallid colour of the young cap and the lilac tints on the stem it

seems better referred to the *Rapaceus* series. It is excluded from the *Aleuriosmus* series by the gills being at first pallid-whitish or clay coloured, not lilac or bluish and by the universal veil not being violet or lilaceous. The KOH reaction of the cap is unknown; this might have further clarified the position of the species.

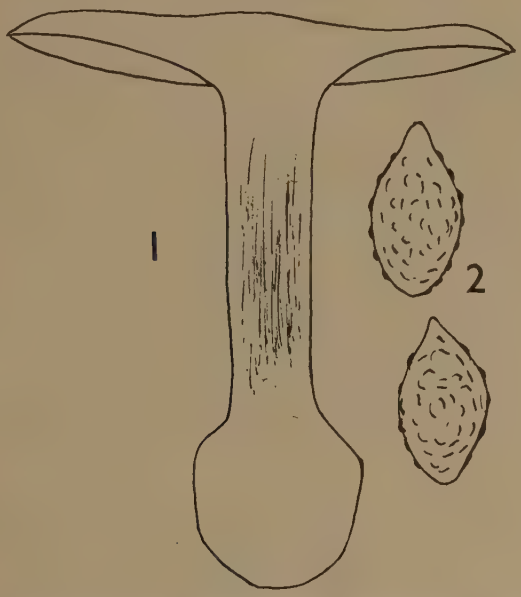

FIG. 1. 1, Longitudinal section through a fruit body, natural size. 2, Spores × 2000.

A class-book of botany.*—The ever-growing number of Indian students of botany will welcome the re-appearance of the only textbook of elementary botany written especially for them. First published thirty years ago, and now, in its eleventh edition much enlarged and revised in the light of recent work especially in the morphological and physiological field, it has provided and will continue to provide a reasonably accurate introduction to all branches of botany. The majority of the plants cited are to be found in India (an excellent appendix gives botanical name, English name and Indian names in eleven local tongues, of all plants in the text) and the 'ecological groups' mentioned are mainly examples of Indian vegetation. It is hoped that future editions will rectify those few points where accuracy has been sacrificed for simplicity, and a plea is added for a better, stronger binding cloth to be used as the present one is hardly strong enough to withstand the rigours to which all excellent text-books of this type are submitted.

P. F. HUNT

* *A Class-book of Botany*. By A. C. Dutta, 11th Edition (revised and enlarged). Pp. xvii + 625, 812 figures. Calcutta: The Oxford University Press, 1959. Price 20/- (Rs. 11).

The *Menispermaceae* of Malaysia: III*

CYCLEA ARNOTT EX WIGHT

L. L. Forman

In his 'Illustrations of Indian Botany' (1840), Wight recognised that the two species of *Clypea* Bl. which he and Arnott had accepted in their 'Prodromus' (1834) belong to different genera. *Clypea hernandiifolia* (Willd.) Wight & Arn. was considered by Wight as a true *Clypea* (=*Stephania* Lour.). *Clypea burmanni* (DC.) Wight & Arn., however, was made the basis of a new genus for which Arnott had proposed the name *Cyclea* and which was distinguished from *Clypea* chiefly in the calyx of the male flowers 'being of one piece'. Species with free sepals are now included in *Cyclea*; the calyx of the male flowers is distinguished from that of *Stephania* by the single whorl of sepals in contrast to the two whorls in *Stephania*. The inflorescences of *Cyclea* and *Stephania* can easily be distinguished. *Cyclea* has panicles (in some species the lateral branches are reduced to sessile clusters along the main axis), whereas in all Asiatic species of *Stephania* the inflorescence is umbelliform or composed of umbelliform parts, which are sometimes reduced to peduncled, disciform capitula. It is noteworthy that the fruits of *Stephania* are always glabrous although they are sometimes hairy in *Cyclea*.

The type species of *Cyclea*, *C. burmanni* (DC.) Hook. f. & Thoms., was regarded by Diels in 'Das Pflanzenreich' as a synonym of *C. peltata* (Lam.) Hook. f. & Thoms., a species restricted to the Indian subcontinent and therefore not appearing in the following revision.

Cyclea *Arnott ex Wight*, Ill. Ind. Bot. **1**, 22 (1840); Miers, Contrib. Bot. **3**, 234 (1871); Diels in Engl., Pflanzenr. Menisp. 309 (1910); Ridley, Fl. Mal. Penin. **1**, 114 (1922).

Climbing shrubs. *Leaves* with lamina often peltate and palmately nerved. *Inflorescences* axillary or cauliflorous, racemose or paniculate. *Male flowers*: sepals 4 or 5, free or connate into a 4- or 5-lobed calyx; petals 4 or 5, free or connate into a 4- or 5-lobed corolla (or rarely absent); stamens connate into a peltate synandrium with 4 or 5 anthers borne on the margin of a disc and dehiscing transversely. *Female flowers*: sepals and petals 1 or 2 (rarely petals absent); carpel solitary, style very short, stigma trifid. *Drupes* ± obovate to rotund in outline, with style-scar near base, sometimes pubescent; endocarp bony, containing a horseshoe-shaped cavity, sometimes laterally convex, often perforate laterally and between style-scar and base, dorsally bearing 3 to 6 rows of tubercles. *Seed* curved.

Distribution. India to Central and South China, Siam, Indo-China, Malaya, Sumatra, Java, Borneo and Philippines. About 29 species of which 9 occur in Malaysia.

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* Continued from K.B. **12**, 459 (1958).

KEY TO SPECIES

1. Inflorescences unbranched; flowers densely crowded in spaced, sessile clusters . . . . . 1. *kinabaluensis*
1. Inflorescences paniculate:
2. Lamina glabrous on both surfaces . . . . . 2. *elegans*
2. Lamina hairy on lower surface:
3. Young stems bearing short hairs interspersed or not with long, straight, spreading hairs; sepals of ♂ flowers free or almost free:
4. Lamina not peltate . . . . . 3. *atjehensis*
4. Lamina peltate:
5. Petiole inserted 1–5 mm. from basal margin of lamina 4. *merrillii*
5. Petiole inserted more than 6 mm. from basal margin of lamina:
6. Lamina 15–21 cm. long, apex gradually acuminate; young stems bearing short hairs interspersed with long, straight hairs . . . . . 5. *robusta*
6. Lamina 7·5–12·5 cm. long; apex abruptly acuminate to subcaudate; young stems puberulous . . . 6. *cauliflora*
3. Young stems bearing only long, straight, spreading hairs; sepals of ♂ flowers united for at least half their length:
7. Flowers male:
8. Calyx glabrous or subglabrous; petals free . . 7. *laxiflora*
8. Calyx puberulous:
9. Petals free . . . . . 8. *peregrina*
9. Petals connate . . . . . 9. *barbata*
7. Flowers female:
10. Flowers clearly spaced in lax clusters:
11. Young ovaries glabrous or subglabrous . . 7. *laxiflora*
11. Young ovaries puberulous . . . . . 8. *peregrina*
10. Flowers tightly crowded in subglobose heads; ovaries tomentose . . . . . 9. *barbata*

1. Cyclea kinabaluensis *Forman*, sp. nov.

Frutex scandens. *Ramuli* 2–2·5 mm. diametro. *Folia* petiolis 3–6 cm. longis circa 1 mm. supra basim laminae insertis; lamina deltoidea–ovata usque ad triangulari-ovata, apice longe et tenuiter acuminata, basi obtusissima, truncata vel cordata, 7–12·5 cm. longa, 4·5–10 cm. lata, palmatim 5–7-nervis, utrinque reticulo tenui et prominente, sparse puberula vel glabra, supra subnitida, subtus opaca, rigide chartacea. *Inflorescentiae masculae* axillares, haud ramosae, 4–7 cm. longae; flores in glomerulis sessilibus, 0·5–1·0 cm. distantibus dispositi. *Flores masculi* virides, sessiles; sepala 4, inferne connata vel fere libera, late obovata, 1·5–2·0 mm. longa, 1·25–2·0 mm. lata; corolla subdiscoidea margine leviter lobato, 0·5–1·0 mm. longa, carnosa, glabra; synandrium 0·5 mm. longum. *Inflorescentiae foemineae* masculis similes usque ad 13 cm. longae. *Flores foeminei*: sepala 2 vel 3, libera, obovata vel subreniformia, 1·0 mm. longa, 0·75–1·75 mm. lata, externe puberula; petala 2 vel 3, libera vel inferne connata, forma satis variabilis, plus minusve cuneata usque ad reniformia, 0·75 mm. longa, glabra; ovarium subellipsoidale, 1·0 mm. longum, glabrum; stigma 3–5-lobatum, lobis

divaricatis triangularibus. *Drupae* sessiles, in ambitu rotundae, 7 mm. diametro, glabrae vel subglabrae; endocarpium dorso 4 seriebus tuberculorum ornatum.

DISTRIBUTION: North Borneo, Mt. Kinabalu.

KEY TO VARIETIES

Inflorescences, stems and petioles golden-brown puberulous
1. var. *kinabaluensis*

Inflorescences glabrous. Stems and petioles covered with yellowish hairs, sometimes long and spreading, or subglabrous . . 2. var. *hispida*

1. var. **kinabaluensis**

Ramuli, petioli, inflorescentiae, sepala omnes pilis aureo-brunneis puberula.

TYPUS: *Clemens* 32626 (holotypus in BM, isotypi in A, BO, L).

HABITAT. Recorded between altitudes of 1700 to 2800 m.

COLLECTIONS EXAMINED:—

All from N. Borneo, Mt. Kinabalu:—Marai Parai; March (♀ fr.), *Clemens* 32626 (A, BM, BO, L). *Ibidem*; April (♀ fl.), *Clemens* 32661 (BO, L). Colombon River; June (♂), *Clemens* 33763 (A, BM, BO, L). *Ibidem*; June (? fl.), *Clemens* 33828 (A, BM, BO, L).

NOTES. The flowers are normally sessile, but in the specimen of *Clemens* 33763 in the Arnold Arboretum there are a few abnormal flowers borne on pedicels up to 4 mm. long and containing additional floral parts.

2. var. **hispida** *Forman*, var. nov.

Ramuli pilis brevibus flavidis nonnunquam pilis longis et patentibus intermixtis obtecti, demum glabrescentes. *Petioli* flavido-hispidi, flavido-puberuli vel subglabri. *Inflorescentiae* et flores glabra.

TYPUS: *Clemens* 28558 (holotypus in K; isotypi in A, BO, L).

HABITAT. Recorded from 1700 m. altitude.

NOTES. This variety is represented by only one gathering, *Clemens* 28558, which is female. It agrees with var. *kinabaluensis* in all characters apart from its glabrous inflorescences and flowers, and hispid branchlets.

A further collection from Mt. Kinabalu by J. & M. S. Clemens, No 31297, is referred to var. *hispida* with some doubt. The stems and leaves are entirely glabrous except for a tuft of hispid hairs immediately above each axil. The leaves differ from the type of var. *hispida* in being generally more shortly acuminate and thicker in texture, with the main nerves drying impressed on the upper surface, and also in the lower surface being minutely papillose. The detached fragments of inflorescence are female and entirely glabrous, thus agreeing with var. *hispida*.

COLLECTIONS EXAMINED:—

N. BORNEO, Mt. Kinabalu, Tenompok; Feb. (♀ fl., fr.), *Clemens* 28558 (A, BO, K, L). ? [Ibidem, Penibukan; Feb. (♀ fl.), *Clemens* 31297 (A, BO)].

2. Cyclea elegans *King* in Journ. As. Soc. Bengal **58** (2), 387 (1889); Diels in Engl. Pflanzenr. Menisp. 311 (1910); Ridley, Fl. Mal. Penin. **1**, 115 (1922); Burkill et Henderson in Gard. Bull. Str. Settl. **3**, 344 (1925); Airy Shaw in Kew Bull. **1939**, 538 (1940); Yamamoto in Journ. Soc. Trop. Agric. **16**, 145 (1944). Types: Malaya, Perak *King's coll.* 2288 (syn. BM!, K!); *Ibidem, Scortechini* 787 (syn. BM!, K!).

Cyclea caudata Merrill in Journ. As. Soc. Str. Br. **85**, 172 (1922); Yamamoto in Journ. Soc. Trop. Agric. **16**, 145 (1944). Type: Sarawak, Upper Baram, *Moulton* 87 (iso. SING!).

Cyclea acuminatissima Merrill in Papers Mich. Acad. Sci. **24**, 68 (1939). Type: Sumatra, E. Coast, Asahan, *Rahmat* 8935 (holo. A!).

Cyclea scyphigera Suessenguth & Heine in Mitt. Bot. Staats. München, **2**, 59 (1950) incl. forma *angustifolia* Suesseng. & Heine; Heine in Fedde, Rep. **54**, 227 (1951). Types: N. Borneo, Mt. Kinabalu, *Clemens* 26160 (isotype of forma *scyphigera*, K!, L!), *Clemens* 26227 (isotype of forma *angustifolia* K!, L!).

[*Cyclea tonkinensis* (non Gagnep.)—Yamamoto in Journ. Soc. Trop. Agric. **16**, 145 (1944)]

Slender climber, up to about 4 m. high. *Stems* woody, 1·5–4·0 mm. diameter, puberulous to glabrous. *Leaves* petiolate; petioles 2–3 cm. long, minutely puberulous to glabrous, inserted at, or up to 5 mm. from, basal margin of lamina; lamina lanceolate or ovate-lanceolate, apex usually attenuately acuminate to caudate, sometimes abruptly acuminate, base rounded, truncate or cordate, 6–15 cm. long, (2–) 3–4 (–5·5) cm. broad; palmately 3–5-nerved; both surfaces glabrous; chartaceous. *Male inflorescences* axillary, narrowly paniculate, 7–17 cm. long, 0·7–1·7 cm. broad, flowers borne in lax cymes on peduncles 4–7 mm. long, puberulous throughout with yellow-brown hairs. *Male flowers* yellow, borne on puberulous pedicels up to 1·5 mm. long; calyx subcampanulate, shortly 4-lobed, 1 mm. long, 1·25 mm. broad, glabrous; corolla entire, broadly cyathiform, 0·75 mm. long, 1 mm. broad, glabrous; synandrium not exserted, 1 mm. long. *Female inflorescences* similar to male but flowers on lateral branches in scarcely peduncled racemes or subracemes 3–10 mm. long. *Female flowers* greenish borne on puberulous pedicels at first 0·5 mm. and later up to 1·5 mm. long; petals and sepals early caducous; sepals 2, ± broadly elliptic, 1 mm. long, 0·5 mm. broad, minutely puberulous outside; petals 2, subrotund, 0·5 mm. long, glabrous; ovary obliquely ovoid 0·75 mm. long, glabrous, stigma obscurely and bluntly lobed. *Drupes* on pedicels 1–2 mm. long, obliquely obovate in outline, 6–7 mm. long, 5–6 mm. broad, 3 mm. thick, glabrous; endocarp bearing 3 rows of papilliform tubercles on both faces.

Distribution. Sumatra, Malaya, Borneo.

Habitat. In forests at altitudes of 300 m. to 1800 m.

Collections examined:—

Sumatra. Benkulen; June (♂), *Ajoeb* 118 (BO). Bukit Tinggi; June (♀ fl.), *Bünnemeijer* 3030 (BO). Brani; June (♂), *Bünnemeijer* 3136 (BO). Bandarbaru; March (♂), *Lörzing* 6325 (BO). Asahan, Adian Rindang; Nov. (♂), *Rahmat* 8935 (A).

MALAYA. PERAK: Larut; Sept. (♂), *King's coll.* 2288 (BM, K). (♀ fr.), *Scortechini* 787 (BM, K). SELANGOR: Fraser Hill; Sept. (♂), *Burkill & Holttum* 8620 (BO). *Ibidem*; Aug. (♀ fr.), *Melville* 4778 (K).

BORNEO. SARAWAK: Upper Baram, Salungu; Nov. (♂), *Moulton* 87 (SING). Mount Dulit, near Long Kapa; Aug. (♂), *Richards* 1483 (K, SING). N. BORNEO: Mt. Kinabalu, Tenompok; Aug. (♂), *Clemens* 26160 (K, L). *Ibidem*, Dallas; (♀ fr.), *Clemens* 26227 (K, L). *Ibidem*, Tenompok; Oct. (♂), *Clemens* 26867 (BO, K, L). *Ibidem*, Dallas; Oct. (♀ fr.), *Clemens* 26870 (BO, K). *Ibidem*; Nov. (♀ fr.), *Clemens* 27214 (BO, K, L). *Ibidem*, Tenompok; Feb. (♀ fl.), *Clemens* 28182 (BM, K, L) and 28182A (BO, K). *Ibidem*; Feb. (♂, ♀ fl., fr.), *Clemens* 28319 (BO, K, L). *Ibidem*; March (♂), *Clemens* 28655 (BM, BO, K, L). *Ibidem*; Apr. (♀ fl., fr.), *Clemens* 30378 (BO, K, L). *Ibidem*, Kappok; Jan. (♂), *Clemens* 51303 (BM). *Ibidem*, Tenempok; Dec. (♀ fr.), *Clemens* 51494 (BM, K). Keningau Distr.; Aug. (♂), *SAN* A4436 (L).

3. Cyclea atjehensis *Forman*, sp. nov.

Frutex scandens. *Ramuli* 1·5–6 mm. diametro, pilis flavidis c. 2 mm. longis cum pilis multo brevioribus intermixtis dense obtecti, demum glabescentes. *Folia* petiolis 6–8·5 cm. longis pilis flavidis et longis et brevibus intermixtis obtectis; lamina haud peltata, deltoideo-ovata, apice acuminata mucrone terminata, basi fere truncata et lateraliter sublobata, palmatim 5-nervis, 11–14 cm. longa, 9–10 cm. lata, supra praesertim secundum nervos molliter pubescens, subtus subtomentosa, tenuiter papyracea. *Inflorescentiae masculae* axillares et cauliflorae, anguste paniculatae, 4·5 cm. longae, 0·8 cm. latae, subflavide pubescentes; flores in cymis brevibus lateralibus dispositi. *Flores* masculi pedicellis 1–2 mm. longis: sepala 4, libera oblonga, 2 mm. longa, extra pilis longis obtecta; corolla ad discum carnosum 0·25 mm. longum plus minusve annularem reducta; synandrium 1 mm. longum. *Inflorescentiae foemineae* incognitae. *Infructescentiae* cauliflorae anguste paniculatae, 19 cm. longae, c. 2·5 cm. latae, fructibus conglomeratis in ramis lateralibus brevibus. *Drupae* brevissime pedicellatae vel sessiles, satis dense pilis flavidis et longis et brevibus intermixtis obtectae, in ambitu rotundae 5 mm. longae et latae, cicatrice styli 2–3 mm. a basi distante; endocarpium 6 seriebus tuberculorum ornatum.

TYPUS: N. Sumatra, Atjeh, between Gumpang and Kongke, *van Steenis* 9781 (holotypus in L).

DISTRIBUTION. N. Sumatra, Atjeh.

HABITAT. Recorded from areas of young secondary growth in newly felled forests at altitudes of 700 m. and 1260 m.

COLLECTIONS EXAMINED:—

N. SUMATRA. Atjeh: Above Takengon; Aug. (♀ fr.). *van Steenis* 5946 (BO). Between Gumpang and Kongke; March (♂), *van Steenis* 9781 (L).

4. Cyclea merrillii *Diels* in Engl., Pflanzenr. Menisp. 312, fig. 93F (1910) & in Elmer, Leafl. Philipp. Bot. **4**, 1167 (1911); Merrill, Enum. Philipp. Fl. Pl. **2**, 151 (1923) *pro parte*. Type: Philippines, Luzon, *Merrill* 2527.

Slender climber. Stems herbaceous or slightly woody, 1–2 mm. diameter, puberulous and also bearing long, spreading hairs. *Leaves* with tomentose or glabrescent petioles 2–5 cm. long inserted 1–5 mm. above the basal margin of lamina; lamina broadly ovate to triangular-ovate, apex acuminate, terminating in a long, fine mucro, base rounded, truncate or subcordate, 7–14 cm. long, 5–12 cm. broad; palmately nerved with 5 main ascending nerves;

upper surface pubescent at first, later glabrescent, very finely reticulate; lower surface tomentose; chartaceous. *Male inflorescences* axillary (? also cauliflorous), paniculate, 6–12 (–23) cm. long, yellowish pubescent to tomentose, the flowers borne in small cymose clusters on lateral branches up to 1 (-4) cm. long. *Male flowers* with pedicels c. 1 mm. long; sepals 4, free, ± oblanceolate-elliptic, 1·5 mm. long, 0·75 mm. broad, pubescent outside; corolla campanulate, margin subentire, 1 mm. long, glabrous; synandrium c. 1 mm. long. *Female inflorescences* similar to male but also terminal. *Female flowers* on pedicels 1–2 mm. long; sepals 2, obovate, 1–1·25 mm. long, 0·75 mm. broad, densely pilose outside; petals 2, obovate, 1 mm. long, 0·5 mm. broad, sparsely pilose outside; ovary ± ellipsoidal, very densely pilose, 1 mm. long, style short, glabrous, stigma laciniately 4–5-lobed. *Drupes* unknown.

Distribution. Philippines (Luzon and Panay).

Habitat. According to Merrill (1923), 'in thickets and forests at low and medium altitudes'.

Vernacular Names. *Philippines*: abiab, malatugi.

Collections examined:—

Philippines. Luzon: Bataan Prov., Aug. (fl.), *Bawan & Borromeo* 24283 (K). *Ibidem*, Lamao; Nov. (♀ fl.), *Edaño* 3982 (L.). Rio Marcap; Nov. (♂), *Loher* 1976 (K). Montalban; June (♂), *Loher* 1977 (K). *Ibidem*; April (♂), *Loher* 5548 (K). *Ibidem*; Dec. (♀ fl., fr.), *Loher* 5553 (K). Rizal Prov., Angilog; March (♂), *Loher* 5556 (K). Montalban; March (♀ fl., fr.), *Loher* 5557 (K). Tayabas Prov., Mt. Binuang; May (♂), *Ramos & Edaño* 28836 (K). Bulacan Prov., Angat; Feb. (♀ fl.), *Ramos & Edaño* 34136 (BM, BO). Los Banos, Mt. Maquiling; Nov. (♂), *van Steenis* 17890 (K, L). Bulacan Prov., Angat; March (♂), *Vidal* 2067 (K). Bataan Prov., Mt. Mariveles; April (♂). *Whitford* 1215 (BO, K). Panay, Capriz Prov., Jamindan; (♀ fl.), *Ramos & Edaño* 30891 (BM).

5. Cyclea robusta *Beccari*, Malesia **1**, 157 (1877); Diels in Engl., Pflanzenr. Menisp. 316 (1910); Merr., Enum. Born. Pl. 251 (1921); Yamamoto in Journ. Soc. Trop. Agric. **16**, 145 (1944). Type: Borneo, Sarawak, Kuching, *Beccari s.n.* (FI, not seen).

Climber. Stems 2–6 mm. diameter, puberulous and patently hispid when young, later glabrescent and woody. *Leaves* with puberulous (later glabrescent) petioles 6–11 cm. long, inserted 20–40 mm. from the base of lamina; lamina triangular-ovate to broadly ovate, apex gradually acuminate and terminating in a mucro, base truncate (or slightly emarginate), 15–21 cm. long, 9–17 cm. broad; palmately 11–14-nerved; upper surface glabrous, subnitidous, lower surface subtomentose, very prominently and finely reticulate, stiffly chartaceous. *Male inflorescences* cauliflorous, paniculate, 30–35[–55 *fide* Diels] cm. long, yellowish pubescent, lower branches up to 5·5 cm. long, flowers borne in clusters on short secondary branches. *Male flowers* with pedicels about 1 mm. long; sepals 4, almost free, elliptic to oblanceolate, puberulous outside, 1·5 mm. long, 0·5–0·75 mm. broad; corolla turbinate, margin crenulate, glabrous, scarcely 1 mm. long; synandrium 1·5 mm. long. *Female flowers and fruits* unknown.

Distribution. Borneo, Sarawak.

Notes. The type specimen, which I have not seen, is without leaves, but Diels stated that the flowers of *Hallier* 3033 agree well with those of the type and that the two collections are undoubtedly conspecific.

COLLECTION EXAMINED:—

CENTRAL BORNEO. Mt. Liang Gagang; March (♂), *Hallier* 3033 (BO, K, L).

6. Cyclea cauliflora *Merrill* in Philipp. Journ. Sc. **26**, 452 (1925) & Enum. Philipp. Fl. Pl. **4**, 248 (1926). Type: Philippines, Leyte, Cabalian, *Ramos* 41512 (iso. K!).

Slender climber. *Stems* 1–6 mm. diameter, woody, puberulous when young, later glabrescent. *Leaves* with puberulous petioles 3–7 cm. long inserted 11–22 mm. above the base of lamina; lamina broadly ovate to suborbicular, apex abruptly acuminate to subcaudate, acumen finely mucronate, base truncate to cordate, 7·5–12·5 cm. long, 6·5–11 cm. broad; palmately 11–13-nerved; glabrous or subglabrous above, subtomentose below; submembranous. *Male inflorescences* axillary or cauliflorous (sometimes having the appearance of a terminal or cauliflorous flowering stem from which the leaves have fallen), 15–120 cm. long, laxly and repeatedly branched, puberulous, flowers in subumbellate clusters, bracts linear, tomentose, up to 5 mm. long. *Male flowers* white, borne on pedicels 1–1·5 mm. long; sepals 4, free, elliptic, 1·5–2 mm. long, 0·5 mm. broad, pubescent outside; corolla campanulate, margin entire, 1 mm. long, glabrous, synandrium 1 mm. long. *Female inflorescences* ? cauliflorous, about 30 cm. long, with lower lateral branches up to 3 cm. long [to 5 cm. long *fide* Merrill], puberulous; flowers in rather dense clusters arranged along lateral branches, bracts as in male inflorescences. *Female flowers* borne on pedicels 1–1·25 mm. long; sepals 2, variable in shape, ± rotund, 0·75 mm. long, pilose outside; petals ? none; ovary obliquely ellipsoid, 1 mm. long, densely pilose; style 0·25 mm. long, glabrous, laciniately 4- or 5-lobed, lobes 0·75 mm. long. *Drupes* [with pedicels about 5 mm. long, *fide* Merrill], rotund in outline, 5 mm. diameter, glabrous; endocarp bearing 4 longitudinal rows of papilliform tubercles, both faces smooth with slight depression at centre and bordered by prominent ridge.

DISTRIBUTION. Philippines.

HABITAT. *Edaño* 21836 is recorded from a forested ridge at 460 m. altitude.

NOTES. In the specimens of *Ramos & Edaño* 28836 and 75112 which I have examined, the long male inflorescences have been coiled round with leafy stems in such a manner that it is extremely difficult to follow the course of the inflorescences and their branches. It seems probable that the apparently long (up to 120 cm.) flowering shoots really represent a succession of axillary panicles from which the subtending leaves have fallen. There are several undoubtedly axillary inflorescences about 15 cm. long.

In the two specimens of *Ramos* 41103 which I have seen, the female inflorescences are completely detached, and their position on the plant is uncertain.

COLLECTIONS EXAMINED:—

PHILIPPINES. MINDORO, Pinamalayan; June (♀ fl.), Ramos 41103 (BO, SING). LUZON, Tayabas, Mt. Binuang; May, (♂), *Ramos & Edaño* 28836 (K). CATANDUANES; (♂) *Ramos & Edaño* 75112 (SING). LEYTE, Cabalian; Dec., (♀ fl.), *Ramos* 41512 (K). NEGROS, Mt. Katugasan; March (♂), *Edaño* 21836 (L).

7. Cyclea laxiflora *Miers* [in Ann. Mag. Nat. Hist. III. **18**, 19 (1866), *nomen nudum*] Contrib. Bot. **3**, 241 (1871); Diels in Engl., Pflanzenr. Menisp. 317 (1910); Ridley, Fl. Mal. Penin. **1**, 114 (1922); Burkill & Henderson in Gard. Bull. Str. Settl. **3**, 344 (1925); Burkill & Haniff *ibid.* **6**, 171 (1930); Burkill, Dict. Econ. Prod. Mal. Penin. **1**, 722 (1935); Henderson in Mal. Nat. Journ. **6**, 415, t. 375 (1951). Type: Malaya, Malacca, *Griffiths s.n.* (holo. K!).

[*Cyclea korthalsii* Diels ex Norman in Journ. Bot. London **62**, Suppl. 5 (1924) *nomen nudum*].

[*Cyclea peltata* (non (Lam.) Hook. f. & Thoms.)—Beccari, Malesia **1**, 157 *sub* (1877) *pro parte*; Ridley in Journ. Roy. As. Soc. Str. Br. **33**, 43 (1900) 'var. *arnotti* Miers'].

Slender climber up to about 15 m. long. *Stems* hispid to glabrous, herbaceous or slightly woody. *Leaves* with pubescent, usually hispid, petioles (1·3–) 4–6·2 cm. long, inserted 8–22 mm. above the base of the lamina; lamina triangular-ovate, deltoid-ovate or broadly ovate, apex acutely acuminate with acumen finely mucronate, base truncate to slightly emarginate, 9–16 cm. long, 5–13·5 cm. broad, margin usually hispid; palmately 9–11-nerved; sparsely hispid to glabrescent above, fairly densely hispid to puberulous or subtomentose below; chartaceous. *Male inflorescences* axillary, flowers borne in clusters on a lax panicle 15–55 cm. long, about 10–20 cm. broad, puberulous. *Male flowers* with pedicels 1–2 mm. long; calyx white or cream, turbinate, glabrous or subglabrous, 1–1·5 mm. long, lobes 4, broadly triangular, about half the length of tube; petals 4, free, 0·5 mm. long, glabrous; synandrium about 1 mm. long, shortly exserted. *Female inflorescences* cauliflorous (? always), similar to male, 10–35 cm. long, 2·5–10 cm. broad. *Female flowers* on pedicels about 0·5 mm. long; petals and sepals unknown (? early caducous); ovary curved-ellipsoid, 1 mm. long, pilose or glabrous, stigma with 3 filiform, divaricate lobes. *Drupes* white, obliquely obovate to rotund in outline, 5–8 mm. long, 4–6 mm. broad, sparsely pubescent; endocarp bearing 3 rows of papilliform tubercles on both faces.

Distribution. Sumatra, Malaya, Anamba Is. and Lower Siam.

Habitat. Hedges, cultivated land, scrub, coastal and secondary forest at altitudes from 0 m. to 1200 m.

Uses. According to Burkill a decoction made from the roots is used medicinally for fever, piles, following childbirth and as a vermifuge for children.

Vernacular Names. *Malaya*: akar gasing bukit, akar pahit, akar rempenang, akar terong kemang (kemar), chawan, metimum tikus.

Notes. Although Diels described the inflorescences as cauliflorous, the male inflorescences are clearly axillary, as can be seen even in some of the specimens he cites. In a few examples, the leaf subtending the inflorescence has fallen.

Collections examined:—

N. Sumatra: Sibolangit; Jan. (♂), *Lörzing* 4619 (BO, L). *Ibidem*; Jan. (♂), *Lörzing* 9479 (BO). Berhala Is.; Nov. (♂), *Lörzing* 6958 (BO). Palembang: Musi R. between Lampar and Batu Pantjeh; (♀ fl., fr.), *Forbes* 2622a (BM). Bangka: Bukit Beban; Oct. (♂), *Bünnemeijer* 1619 (BO).

Malaya. Perlis, Mata Ajer; Nov. (♂), *Henderson* 23035 (SING). Kedah, Bukit Baling; Aug. (♂), *Nauen* 38016 (SING). Perak: Larut; (♂), *Derry* s.n. 1900 (K). *Ibidem*; (♂), *King's Coll.* 2385 (K). *Ibidem*; Apr. (♀ fr.), *King's Coll.* 4077 (K). Lumut; (♂), *Ridley* 10277 (SING). Mt. Kerbau; March (♀ fr.), *Robinson s.n.* 1913 (K). Trengganu, Bukit Kajang; Nov. (♂), *Corner s.n.* 1935 (SING). Negri Sembilan, Mt. Tampin; Nov. (♂, ♀ fr.), *Holttum* 9514 (SING). *Ibidem*; Nov. (♀ fr.), *Nur* 2812 (SING). Malacca. (♂, ♀ fl.), *Griffith s.n.* (K). Govt. Hill; May (♂, ♀ fl.), *Maingay* 122 (1048) (BM, K, L). Johore. Palau Tinggi; June (♂), *Burkill* 945 (SING). Pulau Aor; May (♀ fl.), *Henderson* 18367 (SING). Singapore. Gardens jungle; July (♂), *Ahmed s.n.* 1916 (BO). *Ibidem*; Feb. (♂), *Nur s.n.* 1929 (BO). Pulau Ubin; (♀ fr.), *Ridley s.n.* 1890 (SING). Changi; (♂), *Ridley s.n.* 1892 (SING). Bukit Timah; Oct, (♂ , *Ridley s.n.* 1896 (SING). *Ibidem*; (♀ fr.), *Ridley s.n.* 1898 (SING). Pasir Panjang; (? fl.). *Ridley s.n.* 1899 (SING). So Chu Kang; (♂), *Ridley s.n.* 1902 (SING).

Anamba Is. Tarempak, Siantan; March (♂), *Henderson* 20159 (K, SING).

Lower Siam. Pattani, Banang Sta.; July (♂), *Kerr* 7398 (K).

8. Cyclea peregrina *Miers* [in Ann. Mag. Nat. Hist. III. **18**, 20 (1866), *nomen nudum*] Contrib. Bot. **3**, 242 (1871); Diels in Engl., Pflanzenr. Menisp. 316 (1910); Merr., Enum. Born. Pl. 251 (1921); Yamamoto in Journ. Soc. Trop. Agric. **16**, 145 (1944). Types: Borneo, Bandjarmasin, *Motley* 673, 684 (syn. K!).

Slender climber. *Stem* 1·5–4 mm. diameter, hispid when young, later glabrescent and woody. *Leaves* with puberulous to glabrescent petioles 2–3 cm. long inserted 9–16 mm. above the base of the lamina; lamina broadly ovate, apex acutely acuminate with acumen finely mucronate, base slightly emarginate, 7·5–10·5 cm. long, 5·5–9 cm. broad; palmately 11–12-nerved; subglabrous above, puberulous below; chartaceous. *Male inflorescences* cauliflorous, 14 cm. long, about 5 cm. broad, puberulous, flowers crowded in dense clusters on lateral branches. *Male flowers* subsessile or with puberulous pedicels up to 0·5 mm. long; calyx turbinate, sparsely puberulous, 1·25 mm. long, lobes 4, broadly triangular, almost equal to length of tube; petals 4, free, 0·25 mm. long, glabrous; synandrium 1 mm. long, scarcely exserted. *Female inflorescences* similar to male. *Female flowers* sessile; sepals and petals unknown; ovary curved-ellipsoid, 1 mm. long, puberulous, stigma 3-laciniate. *Drupes* subrotund in outline, 5 mm. long, 5 mm. broad, puberulous; endocarp bearing 3 rows of papilliform tubercles on both faces.

Distribution. SE. Borneo.

Notes. This species, known only from two specimens collected by Motley at Bandjarmasin about a century ago, is intermediate between *C. barbata* and *C. laxiflora*, having the hairy calyx and dense inflorescence of the former together with the minute, free petals of the latter. It is significant that these two species are not known from Borneo. If more material of *C. peregrina* becomes available it may prove to be synonymous with *C. laxiflora*. The dense inflorescence of *Motley* 684, although bearing open flowers, may possibly be immature with the buds having opened on drying. Furthermore, sparsely hairy calyces do occasionally occur in *C. laxiflora*.

9. Cyclea barbata *Miers* [in Ann. Mag. Nat. Hist. III. **18**, 19 (1866), *nomen nudum*] Contrib. Bot. **3**, 237 (1871); Diels in Engl., Pflanzenr. Menisp. 314 (1910); Backer, Schoolfl. Java 47 (1911); Koord., Exk. Fl. Java 237 (1912); Craib, Fl. Siam. Enum. **1**, 70 (1925); Burkill, Dict. Econ. Prod. Mal. Penin. 721 (1935); Gagnep. in Suppl. Fl. Indo-Chine, **1**, 139 (1938) *pro parte*; Backer, Bekn. Fl. Java (em. ed.) 3, fam. 34, 20 (1941); Yamamoto in

Journ. Soc. Trop. Agric. **16**, 144 (1944); Heyne, Nutt. Pl. Indon. ed. 3. **1**, 618 (1950). Types: Burma, Rangoon, *Wallich* 4978Aa (syn. K!); Taong Dong, *Wallich* 4978E (syn. K!).

[*Cissampelos barbata* Wall., Cat. no. 4978 (1831 -2), *nom. nud.*].

Cyclea wallichii Diels in Engl., Pflanzenr. Menisp. 315 (1910). Type: Sylhet, *Wallich* 4978C (? holo. K!).

Cyclea ciliata Craib in Kew Bull. **1922**, 230 (1922); et Fl. Siam. Enum. **1**, 71 (1925). Type: Siam, Doi Sutep, *Kerr* 3356 (holo. K!).

[*Cyclea peltata* (non (Lamk.) Hook. f. & Thoms.)—Miq., Fl. Ind. Bat. **1** (**2**), 86 (1858) *pro parte*; Scheff. in Nat. Tijdschr. N. I. **32,** 393. t. 15 (1873); Boerl., Cat. Pl. Hort. Bog. **1**, 43 (1899); Boorsma in Teysmannia, **11**, 515 (1900); Backer, Fl. Bat. **1**, 40 (1907), et Voorl. Schoolfl. **9** (1908)].

Slender climber, up to about 5 m. long. *Roots* tuberous. *Stems* herbaceous or woody, hispid when young, later glabrescent. *Leaves* with hispid petioles 3–6·5 cm. long, inserted 6–25 mm. above the base of lamina; lamina ovate, deltoid-ovate or broadly ovate, apex acutely acuminate to obtuse with a finely mucronate acumen, base slightly emarginate, truncate or rounded, 6–17·5 cm. long, 4–12·5 cm. broad, margin often hispid; palmately 9–12-nerved; hispid to subglabrous above, puberulous to tomentose below, occasionally hispid along nerves; chartaceous. *Male inflorescences* axillary or cauliflorous, 7–12 (–30) cm. long, 0·5–4 (–12) cm. broad, puberulous; flowers in dense, subcapitate, hairy clusters interruptedly borne on short lateral branches 1–4 (–7) cm. long. *Male flowers* with pedicels 1–2 mm. long, calyx greenish, turbinate, puberulous, 1·5–2 mm. long, lobes 4 (or 5), triangular, about half the length of tube; corolla gamopetalous, turbinate, margin truncate or obtusely lobed, 0·75 mm. long, glabrous; synandrium 1·5–2 mm. long, usually exserted. *Female inflorescences* similar to male but usually broader, 11–19 cm. long, 3–7 cm. broad. *Female flowers* sessile in dense heads; sepals 2, rhomboid to obovate, 0·5 mm. long and broad, pilose on outer surface; petals 2, ± reniform, opposite to and much broader than sepals, 0·5 mm. long, 0·75–1 mm. broad, glabrous; ovary curved-ellipsoid, 1 mm. long, densely pilose, stigma 3-laciniate. *Drupes* obliquely obovate to rotund in outline, 5–7 mm. long, 4–5·5 mm. broad, puberulous; endocarp bearing 3 rows of papilliform tubercles on both faces.

Distribution. In Malaysia: Simalur Is., Sunda Straits and Java. Also in Assam, Burma, Siam and Cochinchina.

Habitat. In forests, including teak and bamboo forests, also in fields of 'alang-alang' (*Imperata cylindrica* (L.) Beauv.) at altitudes from 0 m. to 1000 m.

Uses. The leaves are commonly used in Java to prepare a refreshment in the form of a jelly called 'tjintjau'. This is usually eaten together with a sweet syrup. The leaves are crushed in water and the mixture left to set. The jelly is also regarded as a stomach-medicine.

According to Heyne, the roots attain considerable size and when dried are used medicinally: a brew prepared from them is used as a prophylactic

against fever. The very bitter taste is due to the alkaloid 'cycleine'. The starch content of the roots is high, and there is about 10 per cent fat-content.

VERNACULAR NAMES. *Simalur Is.*: olor kalimenang, olor labana uding. *Java*: —*Sundanese*: areuj tarawulu, tjamtjau, —*Javanese*: djudju, kepleng, krotok, —*Madurese*: kelemaju telor, terung kemau, tjintjau.

NOTES. Three collections by Koorders differ in some respects from the rest of the material of this species. These are *Koorders* 27853, 34037 (both from C. Java) and 38535 (E. Java). Diels annotated the Bogor specimens of these numbers as '*Cyclea korthalsii* Diels', a name later published as a *nomen nudum* by Norman in Journ. Bot. London **62**, Suppl. 5 (1924), where it was applied to *Forbes* 2622a from Sumatra, which belongs to *C. laxiflora* Miers. In the index to collectors' numbers in Diels' monograph, these three Koorders numbers are all referred to '*Cyclea tomentosa*', a name which I have not been able to find elsewhere. However, Diels cited the same numbers under his general treatment of *Cyclea barbata*.

In these specimens the lamina is smaller and narrower (5–8 cm. long, 2·5–5 cm. broad) than typical *C. barbata* and the petiole is inserted only 1–2 mm. from the basal margin of the lamina. The stems differ in being puberulous and not hispid. Nos. 34037 and 38535 are in fruit. No. 27853 bears young male buds and very few open flowers, of which two were dissected and were both found to have one petal completely free from the rest of the gamopetalous corolla. I am uncertain of the taxonomic value of the above differences. These collections may be provisionally regarded as representing aberrant forms of *C. barbata*.

Diels placed *C. barbata* in his key under 'Synandrium inclusum', although the synandrium is usually exserted. *C. wallichii*, which Diels originally described and placed under 'Synandrium exsertum' in his key cannot be distinguished from it and is accordingly reduced to synonymy.

I can find no means of distinguishing the type of *C. ciliata* Craib from *C. barbata*.

MALAYSIAN COLLECTIONS EXAMINED:—

SUMATRA. SIMALUR Is.; April (♀ fr.), *Achmad* 402 (BO). *Ibidem*, Feb. (? fl.), *Achmad* 952 (BO). KRAKATAU GROUP. Sebesi Is.; Apr. (♂), *Doct. v. Leeuwen* 5385 (BO). Krakatau; (st.), *Doct. v. Leeuwen* 12615 et 14224 (BO).

JAVA. No locality; (♂), *Spanoghe s.n.* (K). W. JAVA; Depok; April (♀ fr.), *Backer* 22120 (BO). E. of Tjidadap; Sept. (♀ fr.), *Backer* 22874 (BO). *Ibidem*; Sept. (? fl.), *Backer* 22897 (BO). Djatinegara; Nov. (♂), *Backer* 33385 (BO). Depok, Tjilodong; May (♀ fr.), *Backer* 35162 (BO). Tjidadap, Tjadas-Malang; Oct. (♂), *Bakhuizen v.d. Brink* 1765 et 1851 (BO). Tjidadap, Tjisokandal; Dec. (♂), *Bakhuizen v.d. Brink* 1775 (BO). Purwakarta, Wanajasa; July, (♀ fl., fr.), *Bakhuizen v.d. Brink* 4867 (BO, L). Djakarta; (? fl.), *Edeling s.n.* (BO). Gunungkentjana; June (♀ fr.), *Koorders* 41423 (BO). Tasikmalaja; Aug. (? fl.), *Koorders* 44591 (BO). *Ibidem*; Aug. (♀ fr.), *Koorders* 44592 et 44593 (BO). Wanajasa; (♀ fr.), *van Slooten* 497 (BO). Cheribon, Kuningan; (? fl.), *Vorderman* 56 (BO).—C. JAVA. Margasari; March (♀ fl., fr.), *Beumée* 1776 (BO). Pekalongan, Subah; (♀ fl.), *Beumée* 4272 (BO). E. Tegal; Sept. (♀ fl., fr.), *Beumée* 4441 (BO). Margasari; June (♀ fl., fr.), *Beumée* 6669 (BO). Semarang; April (♂), *de Boer* 3925 (BO). Tempuran, April (♂), *Doct. v. Leeuwen* s.n. (BO). Kedu, Mt. Andong; June (♂ fl.), *Koorders* 27853 (BO, K, L). Ngarengan; April (? fl.), *Koorders* 33606 (BO). Banjumas; Aug. (♀ fl., fr.), *Koorders* 34037 (BO). —E. JAVA. Ponorogo; Jan. (♂), *Beumée* 1326 (BO). Kediri; July (? fl.), *Koorders* 22995 (BO). Malang; June (♀ fl.), *Koorders* 23396 (BO, SING). Ngebel, Mt. Wilis; Aug. (♀ fl.), *Koorders* 29322 (BO). Besuki; Nov. (♀ fr.), *Koorders* 38535 (BO). Glenmore; May (♂), *Rant* 1021 (BO). Kediri, Tritik; Jan. (♂), *Thorenaar* 332 (BO).

Cult. in Hort. Bogor: XII. B. 219a; (♂), (BO). XV. D. 56a; (♀ fl.), (BO). XVI. D. 55; (♂), (K). XVI. D. 59; (♀ fl., fr., ♂), (BO).

'*Elaphoglossum decurrens* (Desv.) Moore' in South-east Asia

P. R. Bell (University College, London)

During a revision of the species of *Elaphoglossum* in South-east Asia, it has been discovered that the plant commonly referred to *E. decurrens* does not in fact belong to that species.

The type specimen of *Acrostichum decurrens* Desv. is in the Paris herbarium. It consists only of a sterile and a fertile frond, detached possibly from different rhizomes, and mounted side by side. The label states that the material is from a herbarium ('Ex herb.') the name of which has not yet been deciphered. The provenance is given as 'india orientalis'.

The lamina of the sterile frond of the type specimen is obovate, narrowly decurrent on to the petiole, and about 14·0 cm. in length. At 3·0 to 5·0 cm. from the tip the lamina reaches its maximum width of c. 2·5 cm. The lamina becomes thinner at the margin and the margin itself is cartilaginous, about 0·5 mm. wide, and is uniformly reflexed. There are about 2 cm. of free petiole below the lamina; the petiole is almost black below, suggesting that it was cut from the rhizome close to its insertion. The fertile frond has a narrow obovate lamina, 7·0 cm. long and reaching a maximum width of 1·0 cm. It, too, is narrowly decurrent, leaving 4·0 cm. of petiole free, also probably cut near the rhizome.

Acrostichum decurrens was validly published by Desvaux in 1811, together with a description. The species was redescribed by Blume in 1828, and his description, although very similar to Desvaux's, refers to the margin of the lamina as 'incrassate', instead of 'sub-incrassate' as in the original. It will be seen later that this was a significant change. Blume's description was based on Javan material, and an illustration of a Javan plant was subsequently published in the 'Flora Javae' (1829) (the authority for this date is Danser (1939)). The description accompanying this plate is not identical with the earlier one of 1828; it is fuller and the margin is now once again described as 'sub-incrassate'. Fée (1844–45), believing, incorrectly, that Desvaux's description had never been published, issued yet another description of *A. decurrens*. This was based on a plant from the Philippines (*Cuming* 144), which belongs in fact to a third species and will not be considered further here.

Blume's plate is an excellent illustration of the plant which has passed for *E. decurrens* in SE. Asia. It is plainly different from Desvaux's plant. Both the sterile and fertile fronds are conspicuously larger. In an examination of the specimens of '*E. decurrens*' in the Rijksherbarium, Leiden, one sheet was discovered with a detached sterile frond which exactly fitted in outline, except for a broken tip, the left-hand frond of the plant figured in the 'Flora Javae'. Written on the sheet is '*Frons sterilis A. decurrens*, Desv. Java. Herb. Dr. Blume. Fl. Javae Fil. p. 32 tab. 10!', so it can be taken as almost certain that the frond was detached from the specimen drawn by Blume's artist. The remainder of the specimen has not been traced; it is not at Bogor.

Comparison of this frond and others from similar plants with that of the type specimen of *A. decurrens* reveals that there are differences other than those of the size and proportion. These are as follows.

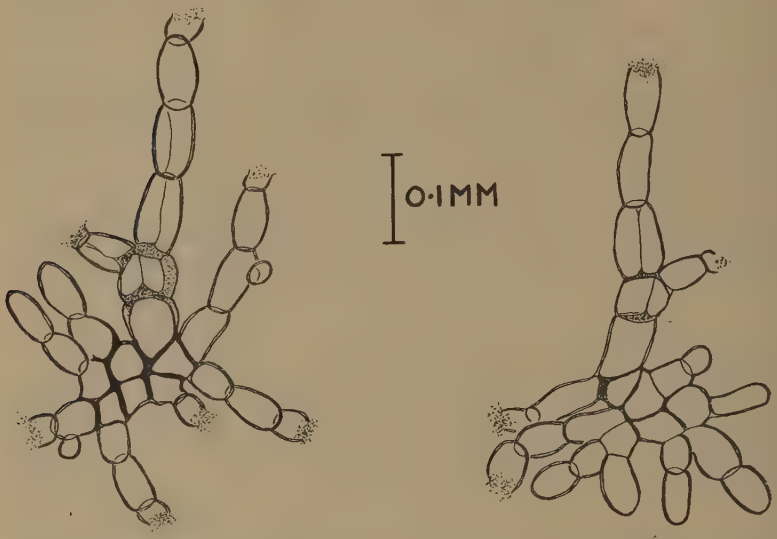

FIG. 1. *Acrostichum decurrens* Desv. Scales from the lower surface of the sterile lamina of the type specimen.

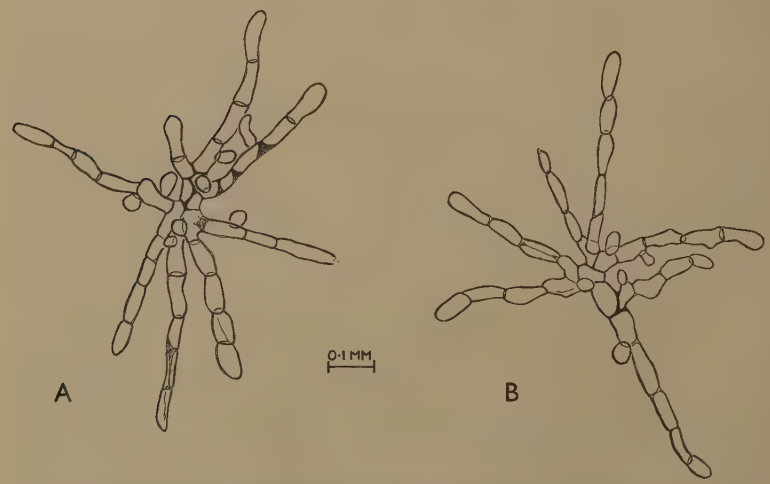

FIG. 2. *Elaphoglossum obtusifolium* Bell. Scales from the lower surface of the sterile lamina. A. From the holotype specimen. B. From a specimen from Sumatra. (*Brooks* 2188).

1. *Scales of the lamina.*

Desvaux states that the laminae of the sterile fronds of his plant are glabrous; Blume affirms that the laminae of the plant referred by him to Desvaux's species possess sparsely distributed stellate scales (see also Blume's plate). In fact, the sterile lamina of Desvaux's type has scattered minute scales beneath, brownish in colour and having a plate of some three to six thickened and deeply pigmented cells at the point of attachment (Fig. 1). The scales from Blume's plant are lighter in colour, generally larger, and deeply divided into filamentous arms (Fig. 2). The glands, which tend to be clustered at or near the bases of the arms, are a conspicuous feature of these scales. In the scales of Desvaux's plant the glandular cells are principally terminal on the arms. The difference between the scales of Desvaux's and Blume's plants is thus a basic structural one and far exceeds the range of variation encountered in either.

FIG. 3. *Elaphoglossum obtusifolium* Bell. T.S. margin of the sterile lamina showing the rib of thickened cells. (From the holotype specimen).

2. *Margin of the lamina.*

In the dried specimens of Blume's plant and others from Malaysia the incrassate margin of the sterile lamina is quite striking, and forms a rib running round the periphery. In section, in a fragment of the lamina treated to restore its turgidity, the rib is seen to be formed by a group of heavily thickened cells, clearly set off from the mesophyll (Fig. 3). The margin

itself is plane and rounded in section. In Desvaux's plant the margin is tapering and slightly recurved, and, although cartilaginous, the thickening rib is absent and the appearance on drying quite different. 'Incrassate' is a much fitter description of the margin of Blume's plant than 'subincrassate'. That Blume substituted the latter for the former in the Flora Javae may have been because he was not describing from actual material in preparing the text of this work and he allowed himself to be influenced by Desvaux's original description.

3. *Spores.*

The spores of all the plants considered here are bilaterally symmetrical and monolete. Examination of a small sample of spores from Desvaux's type suggests that they are consistently smaller in length and breadth than those of plants resembling Blume's, but the difference is trifling and of the order of 2μ or less. There is, however, a striking difference in the perispore. In the

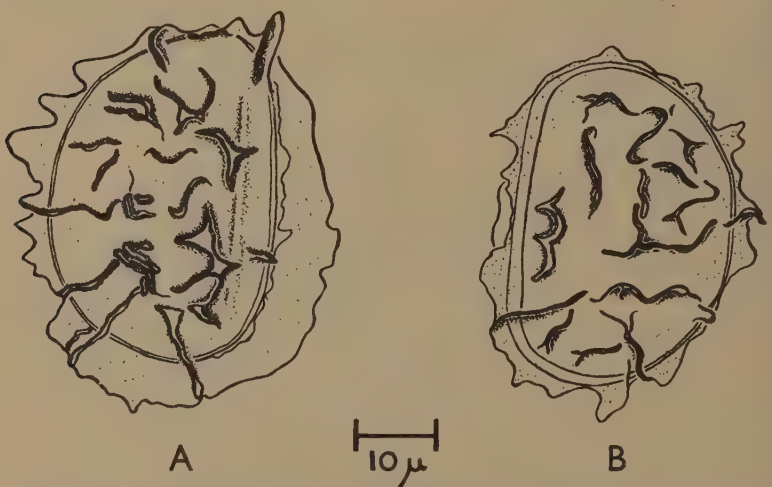

FIG. 4. Spores showing the extent of the perispore. A. *E. obtusifolium* Bell. (*Brooks* s.n., Sumatra). B. *A. decurrens* Desv. (From the type specimen).

plants resembling Blume's the perispore is deeply convoluted and conspicuous, while in Desvaux's type the perispore is much less well developed (Fig. 4). This does not seem to be due to the greater age of Desvaux's plant or the possibility of the spores having been damaged by attrition, since the ridges on the perispore are sharp and distinct.

PROVENANCE OF DESVAUX'S PLANT.

No specimen resembling *A. decurrens* has yet been seen from SE. Asia. There is even a possibility, in view of the lack of precision with which the term 'India orientalis' was formerly used that Desvaux's specimen came from an island in the Indian Ocean and not from Malaysia at all.

Discussion.

It is clear from the foregoing that the plant generally referred to *E. decurrens* in SE. Asia does not belong to that species. The Malaysian plant has also been confused by Blume and others with *Acrostichum obtusifolium* Willd., but the specimen so named by Willdenow was in fact, according to the late A. H. G. Alston who examined the specimen, a juvenile and sterile form of *Phymatodes scolopendria* (see also Christensen (1906)). No species has so far been described to contain the Malaysian plants resembling Blume's specimen and illustration.

Since the epithet *obtusifolium* has never been used to describe a species of *Elaphoglossum* and since it is a very fitting one for the Malaysian plants under discussion, they are referred to a new species *Elaphoglossum obtusifolium*. Although Blume's descriptions of 1828 and 1829 refer to this new species, the descriptions are not identical and not sufficiently precise for modern usage. Accordingly a new diagnosis has been prepared as follows:

Elaphoglossum obtusifolium *Bell*, sp. nov.

Acrostichum decurrens sec. Blume, Enum. Pl. Jav. 102 (1828), non Desv.

Species e grege *Elaphoglossi conformis* (Sw.) Schott. *Rhizoma* repens, paleis angustis lanceolatis acuminatis 10–12 mm. longis, inferne usque 2 mm. latis margine parce ciliatis per apicem sinus basalis affixis pallide brunneis obtectum. *Folia* approximata. *Stipes foliis sterilis* circiter 15 cm. longus, inferne articulatus, paleis eis rhizomatis (supra descriptis) similibus nonnunquam ad laminan adscentibus. *Lamina* elliptica vel late spatulata, circiter 22 cm. longa, superne circiter 5 cm. lata, apice rotundata, basi cuneata, in stipitem breviter decurrens, coriacea; venae obscurae; margo sectione transversa rotundatus, costam cellularum incrassatarum continens; paleae (maturis in laminis non nise ad perficiem imferiorem inventae) minutae, circiter 0·9 mm. latae, dispersae, in bracchia filamentosa ad superficiem appressa fere amnino divisae, glandibus ad medium congregatis. *Stipes foliis fertilis** circiter 20 cm. longus; *lamina* usque 20 cm. longa et 4 cm. lata, apicem versus attenuata. *Spores** (a latere visae) circiter 42 longae et 30 latae, perisporio conspicuo.

Holotypus. *C. L. Blume*, Flora Javae, tab. 10 et *Blume* s.n. (L; sheet No. 908, 332–637) (folium sterile).

Sumatra. Benkoelen, Lebong Tandai, *Brooks* 218. S (BM and BO) ; *Ibidem*, *Brooks* s.n. (BM).

Bangka. *Teijsmann* 84 (BO).

Singapore. Mangrove near Bukit Panjang, *Matthew* s.n. 18. 1. 1907 (K).

Borneo. Sarawak, Matang Woods, *Ridley* s.n. 1. 1915 (K).

Java. *Blume* s.n. (L; sheet Nos. 908, 332–620, 908, 332–621 and 908, 332–637, holotype); *Posthumus* 15 (BO).

The elliptic or widely spathulate sterile laminae of *E. obtusifolium* Bell, with the margin rounded in section and incrassate, are very distinctive

* Described from *Blume* s.n. (Leiden sheet No. 908, 332–621).

and separate this species without difficulty from others, such as *E. norrisii* (Hook.) Bedd., whose sterile laminae bear minute glandular scales similar to those of *E. obtusifolium*.

Acknowledgments

The author is indebted to the late A. H. G. Alston of the British Museum (Natural History), and to F. Ballard of the Royal Botanic Gardens, Kew, for much valuable assistance in the preparation of this paper. The Directors of the Muséum National d'Histoire Naturelle, Paris, the Rijksherbarium, Leiden, and the Herbarium Bogoriense, Bogor, are also gratefully thanked for the loan of material for examination.

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Common Malayan plants.*—During the war, the Japanese Administration of the Botanic Gardens in Singapore produced an illustrated work, printed in Japanese, of Malaysian plants entitled 'Illustrations of Useful Plants of the Southern Regions.' It consisted of two volumes containing several hundred drawings, and is now rare. Professor Gilliland has selected about a third of these drawings and, together with a few additional ones prepared by a Malay artist, he has produced this small popular book for the non-specialist with the purpose of helping him to recognise, by means of the drawings, some of the more common plants of Malaya.

Each line-drawing bears the family and specific name (omitting authorities) of the plant depicted, and also the vernacular name. A brief note is given concerning the plant and its habitat. The 222 drawings are arranged alphabetically by their generic names. The value of this arrangement seems doubtful since closely related genera such as *Amomum* and *Zingiber* are placed so far apart. The likeness of the drawings to the plants depicted is reasonably good, but the drawings are mostly lacking in finish. It appears that they have suffered in reproduction. No indication of scale is given, even on the occasional enlarged portions.

As a popular work on Malayan plants this is a useful addition to the few books available for the non-specialist.

L. L. Forman

* *Common Malayan Plants*. By H. B. Gilliland. Pp. iv + 228, 222 illustr. Singapore: University of Malaya Press, 1958. Price (in Malaya) $5.00.

Laboratory techniques in plant anatomy: I

F. Richardson

A METHOD OF REVIVING SECTIONS OF COMPRESSED WOOD FROM ARCHAEOLOGICAL SITES AND PEAT-BOGS

From time to time archaeologists send specimens of compressed wood or roots to Kew to be identified. Material of this kind is usually obtained from peat-bogs, recent geological deposits or from buried sites, previously occupied by former civilizations. The material, as received, is usually still pliable but so compressed that the cells and tissues no longer exhibit the diagnostic microscopical characters which must be visible if an accurate identification of the botanical origin of the material is to be made.

Various methods of 'reviving' the material have been tried at the Jodrell Laboratory, and a satisfactory technique for dealing with it has now been evolved. Before success was attained, however, numerous experiments were made. The starting point for these investigations was previous experience of preparing satisfactory sections of dried herbarium specimens. The main difficulty to overcome in dealing with herbarium specimens is that the cells and tissues of the plant have already become very distorted when the freshly collected material was first dried. There is, therefore, a distinct similarity between the problem of reviving cells and tissues in herbarium specimens and the revival of cells and tissues in compressed archaeological specimens. The main respect in which the techniques adopted for both purposes at the Jodrell Laboratory differ from those used by previous workers is that the 'revival' of the material is taken in hand after, and not before, the sections have been cut. Experience has shown that it is easier to control the action of a chemical reagent in reviving a section than it is to control the action of the same reagent when it is operating on a larger specimen such as a portion of a leaf, stem, or root.

It is well known that various reagents can be used to induce the walls of plant cells to become swollen. The effect of some of these on sections of compressed material was tried with varying degrees of success. Thus hydrochloric and nitric acids tend to dissolve the sections when these reagents are used at concentrations that are too high. The use of hydrochloric acid was found, in some instances, to be more successful at concentrations of 5–10 per cent, when the sections were partially revived but at the same time they became very fragile and translucent. Solutions of the hydroxides of sodium or potassium were also tried, but the results were not very promising. Sections were also partially revived by treatment with sodium hypochlorite solutions, which can conveniently be applied in the form of domestic bleaching agents such as 'Parozone'. These reagents, unlike hydrochloric and nitric acids, left the sections less translucent and more pliable and therefore easier to handle. Chloral hydrate acts in the same way as, but more slowly than, solutions of sodium hypochlorite. Other reagents such as chlor-zinc-iodine and zinc chloride solutions, which are also well known for their power of promoting swelling in collapsed tissues, were, by themselves, found

to be ineffective in dealing with the collapsed cells and tissues of archaeological specimens.

In the light of these experiences further treatments with sequences of these same reagents were tried. The following treatment has now given such consistently good results over a period of years that it has been adopted as standard procedure for dealing with compressed archaeological specimens. Selected pieces of the material are thoroughly cleaned so as to render them free from soil and any other non-woody material that may be adhering to them. The material is cut into half inch cubes and placed in 95 per cent industrial alcohol (methylated spirit) for about 24 hours. This removes air and also hardens the tissues so that sections can then be cut on a sledge microtome without having to resort to any embedding process. The sections should not be less than 30μ thick, as they tend to break up during the subsequent treatment if they are too thin. The freshly cut sections, Fig. 1, are placed in a petri dish containing 50 per cent alcohol, and subsequently transferred to water in which they are allowed to remain for a few minutes. They are then placed in a petri dish containing a strong solution of sodium hypochlorite, or, as already mentioned, it may be more convenient to use a domestic bleaching solution such as 'Parozone'. When immersed in the bleaching solution, the sections are usually dark coloured or almost black, and they should be allowed to remain in the hypochlorite until they are completely bleached and have begun to expand. The sections are next washed in several changes of water, where further expansion will occur, Fig. 2. A single section is next transferred to a microscope slide and treated with one or other of the following reagents:—zinc chloride solution, chlor-zinc-iodine, or 5–10 per cent hydrochloric acid. (The zinc chloride solution is prepared by dissolving 100 gms. of zinc in 300 ml. of pure, concentrated hydrochloric acid and evaporating to 150 ml. The chlor-zinc-iodine is prepared by mixing the zinc chloride with a solution made by dissolving 12 gms. of potassium iodide in as little water as possible and adding 0·15 gms. of iodine). Of these 3 alternative reagents, chlor-zinc-iodine is usually the most satisfactory because the further expansion of the section can be more easily controlled in this reagent than in the others. The 'revival' of the section is completed by warming the slide over a bunsen burner. The section should be examined under the microscope whilst this last stage is progressing because the section itself will dissolve in the reagent if the heating is too vigorous or carried on for too long. When fully expanded, the section, still on the slide, is carefully irrigated with water to remove the reagent and is then ready for examination in an aqueous mountant, Fig. 3. This method is quite unsuitable for calcified or silicified woods.

Heroes of South American exploration.*—This is a German version of a book which was first published in America in 1945 under the title 'South America called them' and was widely read and reviewed in this country. The author gives brief and attractively illustrated travel biographies of four great heroes of the scientific conquest of South America, La Condamine, Humboldt, Darwin and Spruce.

N. Y. Sandwith

* *Südamerika ruft.* By V. W. von Hagen. Pp. 171, 16 plates (28 figures). Berlin, Frankfurt and Vienna: Ullstein, 1959. Price DM.5.80.

Plate 4

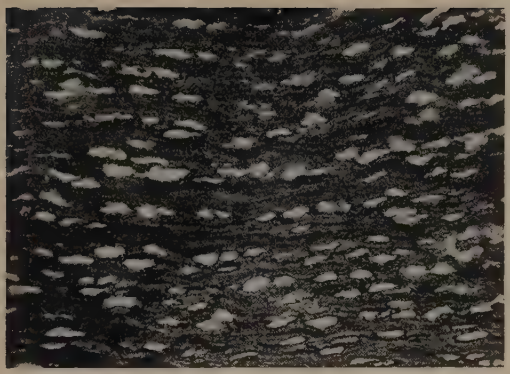

Fig. 1

Fig. 2

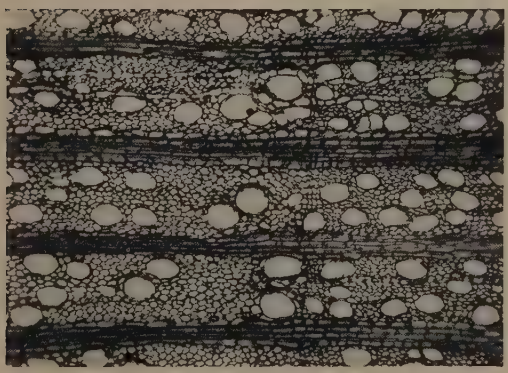

Fig. 3

Fig. 1. Section cut from material after preliminary treatment in alcohol.

Fig. 2. Section bleached and partially expanded after treatment in a sodium hypochlorite solution.

Fig. 3. Completely revived section, stained in aqueous fuchsin, mounted in polyvinyl lacto-phenol.

[*To face page* 86

Laboratory techniques in plant anatomy: II

F. Richardson

A METHOD OF EXAMINING FOSSILIZED OR SEMI-FOSSILIZED PLANT TISSUES IMPREGNATED WITH CALCAREOUS SUBSTANCES

Although the Jodrell Laboratory was at one time a well recognized centre for palaeobotanical investigations, it is only very infrequently that fossilized material is received for examination at the present time. Early in 1958, however, we had occasion to examine a semi-fossilized leaf, which had been collected near Ruwenzori, Uganda, with a view to establishing its botanical affinities. The following technique proved to be so satisfactory in dealing with this unpromising material that it seems worth while to place the details on record.

In the specimen in question some of the substance of the leaf remained, although it was impregnated with calcareous matter. Small pieces of the material were first treated with hydrochloric acid. The concentration is important because, if too strong, the remaining tissues of the leaf become disorganized. With the material from Ruwenzori, 5 per cent hydrochloric acid was first used, but was found to be too strong. It was therefore necessary to work with progressively lower concentrations until a concentration to suit the material was found. An investigator who wishes to try this technique should remember that a series of preliminary trials with acids of different concentrations will generally be necessary before the ideal concentration for his particular material can be determined. With some types of material it may be necessary to use the acid at a concentration of up to 10 per cent.

As a result of the acid treatment, the plant tissues become detached from the calcareous material in which they are embedded. At this stage they may be floated on to a glass slide. Great care is necessary in this operation which can be conveniently performed in a petri dish of suitable size. It is helpful to smear a little egg albumen on the slide which assists in making the plant material adhere. The material on the slide is then irrigated with water to remove the acid and mounted in dilute glycerine. If necessary it can be stained by adding a few drops of eosin, safranin, methylene blue, or any other suitable dye to the mounting medium. No attempt has been made to prepare permanent mounts because the material is usually too fragile to withstand treatment with the necessary dehydrating and clearing agents. It is, however, quite possible that glycerine jelly could be successfully used as a mounting medium.

With the leaf from the Ruwenzori district this treatment revealed the structure of the epidermis and the presence of cystoliths so clearly that there could be little doubt that the leaf was that of a species of *Ficus*. The same technique was successfully used in 1952 to examine some plant remains from a deposit of chalky silt in Yorkshire on a site which had, at the time, been recently excavated by Sir R. E. Mortimer Wheeler. Here the cellular structure of the leaf epidermis was so clearly revealed that it was possible to identify the leaves as those of *Potamogeton natans*.

A metrical study of leaf-shape in hybrids: I

THE LEAF-SHAPE OF SOME F_1 HYBRIDS AND THEIR PARENTS

R. Melville

Introduction

It is well known that the shape of the leaves in F_1 hybrids is intermediate between that of their parents. As a matter of common observation, this fact has been generally accepted, though few precise observations can have been made with the object of determining whether it is justifiable by exact measurement. If hybrid leaf-shapes were always exactly intermediate, taxonomists and others could make good use of the fact. For example, naturally occurring hybrids believed to be the initial crosses between known species-pairs, could be recognised as such, or confirmation could be obtained by making appropriate measurements. Again, if a plant was suspected of being the F_1 hybrid of a particular species, but the second parent was uncertain, then, the leaf-shape of the second parent could be deduced from measurements made upon the leaves of the hybrid and of the known parent.

Unfortunately, such a simple relationship between the leaf-shapes of hybrids and their parents is no more than a taxonomist's dream. Nevertheless, the leaves of F_1 hybrids are sufficiently intermediate in character to make it worth while to examine them critically to see if they reveal regularities in the inheritance of leaf-shape characters.

Materials and Technique

A number of species pairs and their F_1 hybrids are encountered in British gardens. The choice of subjects for investigation fell upon certain trees and shrubs, partly because they would be more likely to present problems similar to those in *Ulmus*, on which it was desired to throw some light, and partly because more abundant material could be obtained from individual woody plants than from herbs. Examples were selected from different genera and families, in order to obtain a range of leaf-shapes without too great an elaboration of form, which would have rendered the work of measurement laborious. With these points in mind, the following were selected for experiment: *Forsythia suspensa* (Thunb.)Vahl, *F. viridissima* Lindl. and their hybrid *F.* × *intermedia* Zab.; *Prunus avium* L., *P. mahaleb* L. and their hybrid *P.* × *fontanesiana* Schneid.; *Rhododendron orbiculare* Decne., *R. williamsianum* Rehd. & Wils. and their hybrid, which lacks a binomial name; *Ribes sanguineum* Pursh, *R. odoratum* Wendl. f. and their hybrid *R.* × *gordonianum* Lem.

Variation in leaf-shape is frequently greater in woody plants than in herbs, as several kinds of shoot may be produced, each with its own series of leaf-shapes. These differ according to the function of the shoot and its place in the ontogenetic series, from seedling to adult. The developmental sequence of leaves, from the base to the apex of a shoot, forms a harmoniously graded series of shapes, conveniently called a 'leaf-spectrum' (Melville, 1953, 1955). In the critical study of leaf-shapes, it is necessary to decide which kind of shoot should be sampled and from what part of its leaf-spectrum leaves are to be taken. Shoots of indeterminate growth were rejected on account of

the difficulty of deciding which leaves on different shoots were comparable. Several kinds of shoot with determinate growth were found on the species examined and as these provided the bulk of the foliage of the plants a selection was made from them. Leaves occurring a short distance below the apices of such shoots appeared to be least variable and possessed shapes characteristic of the species. Generally, the third leaf from the leaf-apex was chosen for investigation. Samples were taken when the shoots had finished growing and the leaves had matured. In *Prunus* and *Rhododendron* there were numerous short spur-shoots from which the leaves were taken. Spur-shoots were not well developed in *Forsythia* and *Ribes* and the leaves were taken from determinate shoots that were 30–40 cm. long in *Forsythia* and 20–30 cm. long in *Ribes*. Subject to these restrictions, which were necessary to ensure that the leaves selected represented similar growth-phases and were in fact comparable with one another, the leaves were taken at random from different parts of individual trees and bushes. In earlier work with elms (Melville, 1937) a statistical examination of the measurements of leaf-samples selected in a similar manner had indicated that reliable means could be obtained from ten leaves. Samples of ten leaves were therefore used in the present studies.

The technique of leaf-measurement was described fully in the paper cited above, so that no more than an outline of the procedure need be given here. The leaf-outlines were drawn on translucent paper and projected in a photographic enlarger to cover a decimal scale, from which co-ordinates of the breadth of the half lamina could be read off directly in terms of percentages of the lamina-lengths. For simple shapes, it was sufficient to determine co-ordinates at ten per cent intervals along the leaf-margin and at a few points of inflection near the base and the apex. Larger numbers of co-ordinates were needed to describe more complex shapes, such as the sinuate-dentate leaves of many oaks. By this procedure, leaf-shapes may be described by a system of rectangular co-ordinates, with an accuracy that depends upon the number of co-ordinates measured. All of the leaves employed in this study were measured by the technique described above, with the exception of those of the *Ribes*. The radial symmetry of the palmate leaves of the currants suggested the use of polar co-ordinates for them. The point of junction of the lamina with the petiole was taken as the node from which the measurements were made. A polar chart was prepared, from which the angles could be read off directly and the lengths measured in terms of percentages of the length of the midrib. Co-ordinates were determined for the tips of the principal lobes, the bases of the sinuses and for certain points of inflection. As the two sides of a leaf differ in shape, one side being broader or more asymmetrical than the other, the co-ordinates of sides of corresponding shape were averaged, without regard to their actual position, whether right or left, on the leaf. The mean co-ordinates obtained by either modification of the technique were plotted and the resulting outline-shapes were copied on a transparent plastic film for convenience in comparison.

Shape-characters in leaves are rarely inherited as complete dominants. The characters discussed are probably the result of the interaction of several genes. When one species has a major effect on one of the shape-characters of a hybrid it is referred to in this paper as partially dominant in relation to that character.

FORSYTHIA

All the leaves of *Forsythia viridissima* are simple and lanceolate in shape, with tapering bases and apices. Two kinds of leaf occur on *F. suspensa*, the one simple, ovate, with an acute apex and rounded base, the other, trifoliolate. The terminal leaflet of the trifoliolate leaves is ovate acute, with a broad cuneate base; it is much larger than the two lateral leaflets. All leaves in the hybrid, *F. intermedia*, are simple and lanceolate, but appreciably broader than in *F. viridissima*.

As one parent-species and the hybrid possessed only simple leaves, it was assumed that the simple leaves of the other parent would be homologous and, accordingly, they were employed in the comparisons. It was noticed that the angles made by the principal lateral nerves with the midrib differed considerably in the two parents and co-ordinates were taken for the two lower nerves on either side in all the leaves. The leaf shapes plotted from the mean co-ordinates are shown in Fig. 1 A, B, C. Although the shape of the hybrid leaf, at first sight, appears to be intermediate, it is far from being so, as comparison with the calculated intermediate at once demonstrates (Fig. 1 D). The upper half of the hybrid leaf scarcely differs in shape from the theoretical intermediate, but the base is wedge-shaped, instead of being rounded as required by the theory. The lower pair of nerves, also, are more widespread in the hybrid than the theory requires.

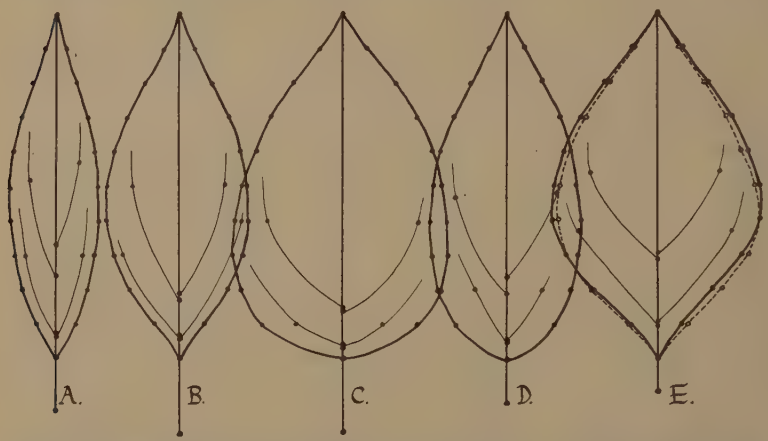

FIG. 1. Mean leaf-shapes in *Forsythia*. A, *F. viridissima*; B, *F.* × *intermedia*; C, *F. suspensa*, simple leaves; D, calculated intermediate between A and C; E, *F. suspensa*, terminal leaflets of trifoliolate leaves (full line) and theoretical parent calculated from A and B (broken line).

The measurements suggest that both parents contribute equally to the inheritance of shape in the apical half of the hybrid leaf. From the middle of the leaf towards the base, the hybrid differs increasingly from the theoretical shape and superficially approximates to the shape of the leaf-base in *F. viridissima*. It might be supposed that *F. viridissima* becomes increasingly dominant in the control of leaf-shape in the hybrid as the base is approached were it not for the concave curvatures of the leaf-margin at the base. The basal curvatures are convex in both parent species, so that convex curves

would be expected. Some further considerations also throw doubt on the validity of the original assumptions. If a putative second parent is calculated from the leaf-shapes of *F. suspensa* and the hybrid, negative co-ordinates are found for the basal points in the theoretical *F. viridissima*. When the putative second parent is calculated from *F. viridissima* and the hybrid the theoretical leaf obtained for *F. suspensa* is ovate with an acute apex and a wedge-shaped instead of a rounded base. These results can be explained only if one or other of the original assumptions is untrue. Two assumptions are involved. The first, that hybrid leaf-shapes are intermediate between those of their parents, is known to be approximately true from numerous observations. The second is that the simple leaves of both the parents and the hybrid are homologous. This can be tested by comparing the terminal leaflets of the trifoliolate leaves of *F. suspensa* with the leaves of *F. viridissima* and the hybrid.

A sample of the terminal leaflets of *F. suspensa* was thereupon collected and measured. The mean shape (Fig. 1 E) differed nowhere in breadth by more than 1·5 per cent of the lamina length from the theoretical putative parent leaf already calculated from *F. viridissima* and the hybrid. Such a close fit between the theoretical and actual leaves is not likely to be fortuitous. The conclusion must be drawn that the terminal leaflets of *F. suspensa* are homologous with the simple leaves of *F. viridissima* and *F.* × *intermedia* and that the simple leaves of *F. suspensa* are not homologous. If this is admitted, then *F.* × *intermedia* is an almost perfect intermediate in its leaf-shape.

Prunus

The leaves of the Gean or Mazzard, *Prunus avium*, are of a narrow obovate shape, with a cuspidate to acute apex and a gradually tapering base. A second species, the St. Lucie Cherry, *P. mahaleb*, has broadly ovate to suborbicular leaves, which taper abruptly to an acute point and have a broad rounded base. The hybrid, *P.* × *fontanesiana*, has ovate-elliptic leaves, the apex being acute and but rarely slightly cuspidate, while the base, though much narrower than in *P. mahaleb*, is generally more or less rounded. The hybrid leaf shape is certainly intermediate in aspect, but the general appearance of the tree is closest to that of *P. avium*, mainly on account of the size of the leaves. Leaf-size appears to be inherited as a partially dominant character from *P. avium*, the mean lamina-lengths determined from the measured leaves being: *P. avium*, 11·0 cm.; *P.* × *fontanesiana*, 8·5 cm.; *P. mahaleb* 3·4 cm.

A more critical comparison of the mean leaf-shapes was made by superimposing transparencies of the leaf-outlines, Fig. 2 A, B, C. It was then seen that the hybrid was similar in shape to *P. mahaleb* for the terminal 15 per cent of the lamina-length. Below this level, *P. mahaleb* was persistently broader. The outlines of *P. avium* and the hybrid coincide at about 30 per cent of the lamina-length below the apex. That the hybrid was tending more and more towards *P. avium* as the base was approached could be seen by a comparison with the calculated intermediate, Fig. 2 D. The shape of the lower half of the hybrid leaf more closely resembled that of *P. avium*, except that the base itself was rounded instead of wedge shaped. It appeared, therefore, that the intermediate appearance of the hybrid leaves was the result of an interaction between growth control mechanisms inherited from both parents, in which both were always apparent, but that their actions were graded along the

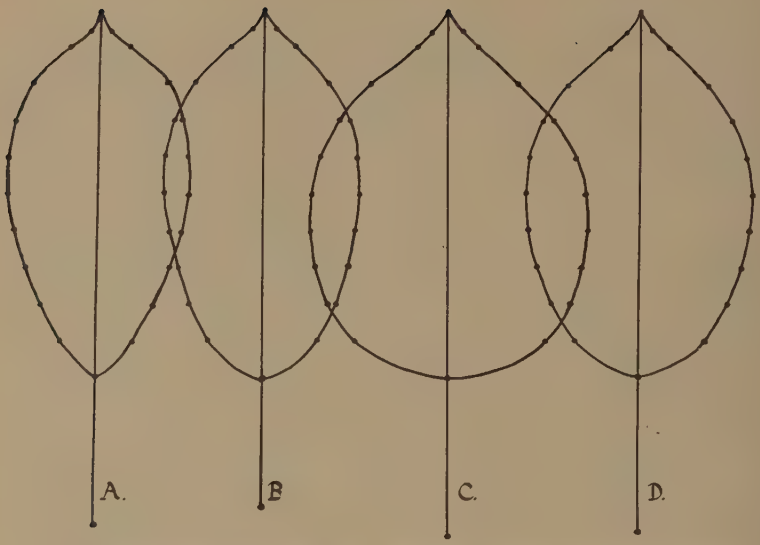

FIG. 2. Mean leaf-shapes in *Prunus*. A, *P. avium*; B, *P.* × *fontanesiana*; C, *P. mahaleb*; D, calculated intermediate between A and C.

leaf-axis. *P. avium* exerted its maximum effect towards the base, while *P. mahaleb* was more effective towards the apex.

RHODODENDRON

Rhododendron williamsianum is a small shrub about 30 cm. high, with broadly ovate leaves, shallowly subcordate at the base and tapering slightly towards the apex, which terminates in an apiculus or a small cusp. *R. orbiculare* is a somewhat larger shrub, about 60 cm. high, with larger elliptical leaves. These are narrowed slightly towards the base, which is rather deeply cordate-auriculate, the sinus on either side of the petiole being rounded. The apex has a broader cusp than in *R. williamsianum*. The leaves of the hybrid are more rounded than in either parent. The apical cusp is intermediate in size and shape and the base is rather deeply cordate, with the sinuses open and without the rounded embayment of *R. orbiculare*. The hybrid leaves are of intermediate size, the mean lamina lengths of the measured leaves being: *R. williamsianum*, 3·6 cm.; the hybrid, 4·8 cm.; *R. orbiculare*, 6·5 cm. The leaves of all three plants are of a thick leathery texture and are borne on stout petioles. Relative petiole-lengths, expressed as percentages of the lamina-length, tend towards the smaller parent, the proportions taken in the same order being: 34, 45 and 62 per cent.

It was evident that the hybrid leaves were intermediate in a number of respects, but their most notable features were the more rounded shape and a greater relative breadth than either parent. By superimposing transparencies of the mean leaf-shapes, it was seen that the hybrid approximated very closely to *R. orbiculare* in the apical fifth of the leaf, but was much broader than it in the basal fifth. In comparison with *R. williamsianum*, the hybrid was appreciably broader in the apical fifth and although broader also

in the basal region, it nevertheless approximated more closely in breadth in the basal fifth than elsewhere.

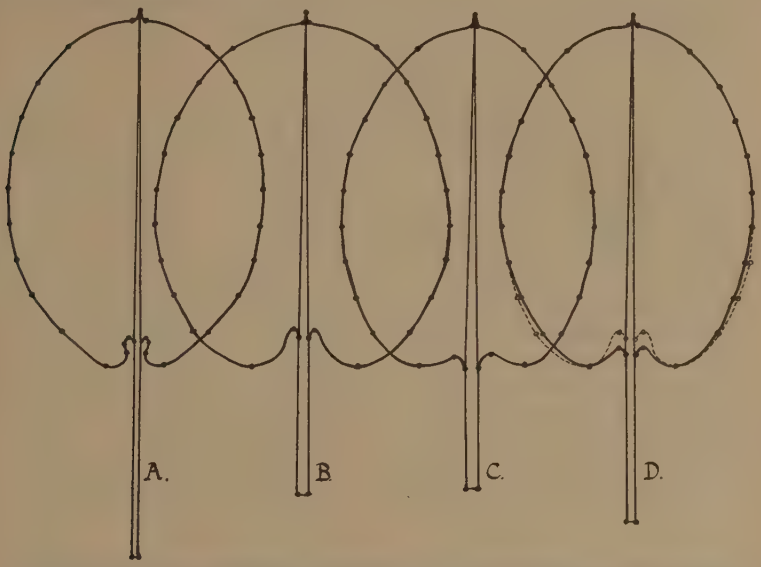

FIG. 3. Mean leaf-shapes in *Rhododendron*. A, *R. orbiculare*; R, *R. orbiculare* × *williamsianum*; C, *R. williamsianum*; D, calculated intermediate between A and C (full line) and actual hybrid (B) reduced to same maximum breadth, (broken line).

So far as the general breadth relationships of the leaves were concerned *R. williamsianum* was partially dominant at the base of the leaf in the hybrid and *R. orbiculare* at the apex, with an interaction and intergradation of their effects in the intervening parts. Evidently the deep basal sinus of *R. orbiculare* was inherited independently of the breadth-control mechanism of the leaves, although the shape of the sinus was modified by the greater relative breadth at the base of *R. williamsianum*. The greater relative breadth throughout the length of the hybrid leaf could be regarded as a form of heterosis, a result of the interaction and integration of dominant growth mechanisms derived from both parents. Each parental mechanism was effective in the hybrid in that region of the leaf where it normally exerted its maximum action.

A theoretical hybrid leaf-shape was calculated as the mean between the two parents. It was narrower than the measured hybrid, as might be expected in the presence of positive heterosis. The degree of similarity of the actual and calculated hybrid shapes is not at first apparent, but the comparison is facilitated if the co-ordinates of breadth of the measured leaf are reduced in arithmetical proportion in the ratio of the maximum breadth of the theoretical to that of the actual hybrid. When superimposed, the recalculated leaf-shape (Fig. 3 D, broken line) is almost exactly coincident with the theoretical hybrid shape, except for the basal sinus. It follows that, had the theory of hybrid intermediacy been tested with the *Rhododendron*

data, the theoretical parental shapes calculated from the known parent and the hybrid would have been a close approximation to the actual leaf-shape of the sought-for parent. On account of the heterosis in the hybrid, these shapes would have been too broad, but could have served as a guide for identification.

RIBES

The two species of *Ribes* employed in this study are of North American origin. *R. sanguineum* is the shrub popularly known as the 'Flowering Currant' and commonly grown in British gardens for its attractive pink flowers. The leaves are cut palmately into rather broad blunt lobes, the margins of which are fairly regularly toothed. The smaller nerves are sunken below the general leaf-surface, which is roughened thereby. *R. odoratum* is a more sparingly branched shrub and bears fragrant lemon-yellow flowers. The leaves are smaller, the lobes are sharper, rather narrow and almost parallel sided, while the margin is without secondary teeth and the smaller nerves are flush with the leaf-surface, which is smooth.

The hybrid, *R.* × *gordonianum*, is a vigorous shrub inheriting both the pink anthocyanin pigment of the one parent and the yellow plastid pigment of the other, the two mingling with pleasing effect. The hybrid leaves are closest in size to those of *R. sanguineum*, the mean lamina-lengths of the measured leaves being: *R. sanguineum*, 4·3 cm.; *R.* × *gordonianum*, 3·9 cm.; *R. odoratum*, 2·8 cm. In addition, the sunken nerves of the leaf and a certain degree of toothing of the margin, lend to the hybrid much of the aspect of *R. sanguineum*. The effect of *R. odoratum* is apparent, however, in the lesser degree of toothing of the margin, the lobes often nearly parallel sided and less deeply sunken nerves, as well as in other minor features.

The mean leaf-shapes of the three plants are illustrated in fig. 4. The drawings have been simplified by the omission of the marginal toothing, which does not affect the underlying shape of the leaves, with which this study is concerned. Asymmetry of the leaves was often very marked in *R. sanguineum*, the large basal lobe (Fig. 4, lobe III) on one side being rounded and on the other having a somewhat flattened outline, with the outer margin sometimes nearly parallel with the midrib. A similar kind of asymmetry occurs in the leaves of *R. odoratum*, although it was much less obvious on account of the narrowness of the lobes.

The interaction between leaf-shape characters in the *Ribes* hybrid appeared to be more complex than in the other hybrids examined. Some general features have been noted already, but no character of either parent was completely dominant. *R. sanguineum* was partially dominant in its effect on the breadths of the large lateral lobes and of the apical segment as a whole. Characters partially dominant from *R. odoratum* were the position of origin on the midrib of the nerves serving the subterminal lobes (Fig. 4, lobes IV) and the relative length of the apical segment of the leaf, measured from the base of the major lateral sinuses, (Fig. 4, point 11).

The subterminal lobes, numbered IV, are well developed in *R. odoratum* and in *R.* × *gordonianum*, but are often not well marked in *R. sanguineum* in which the serrature on the apical portion of the leaf may be shallow. The position of the apex of the lobe (point 13) is never in doubt as it marks the marginal termination of the second lateral nerve, which leaves the midrib at point D. The base of the sinus (point 14) lies between the minor serratures

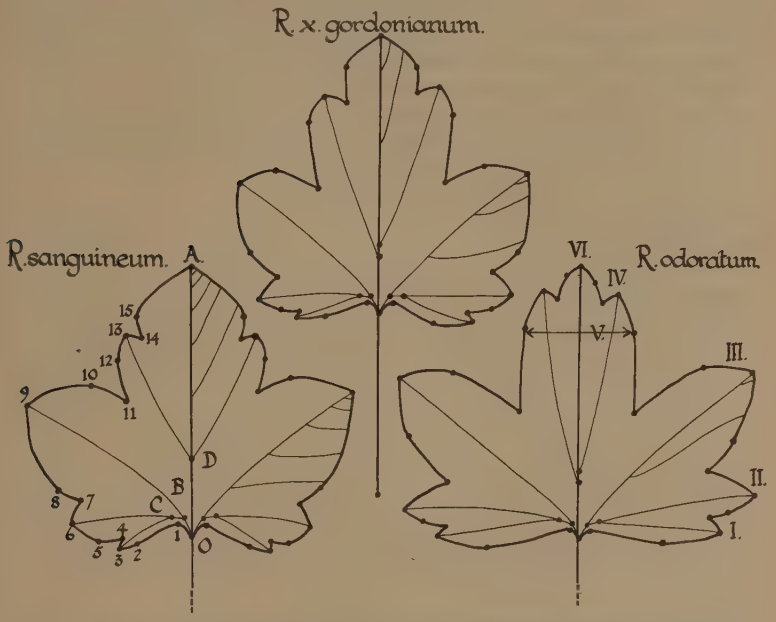

FIG. 4. Mean leaf-shapes of *Ribes sanguineum*, *R.* × *gordonianum* and *R. odoratum*, based on polar co-ordinates. O, point of origin; arabic numerals, successive measured co-ordinates on margin; A, apex, B. C. D. principal nerve-intersections. The numbering of the lobes of the lamina is shown by Roman numerals. Similar notation applies to both halves of the leaves. The sequence of lateral nerves is shown in the right half of each leaf.

served by ternary nerves from the second and third lateral nerves of the midrib and is easily recognisable even when the serratures are shallow. Intermediate characters, depending more or less directly on the interaction of those mentioned above, were the angles enclosed between the midrib and the nerves serving the subterminal lobes (Fig. 4, angle A.D. 13) and the relative breadth of the apical lobe (lobe VI, between points 14, 14). The most unusual features of the hybrid leaves, however, were the relative shortness of the main lateral lobes (lobe III) and the relative breadth of the subterminal lobes (lobe IV). In proportion, the former are shorter than in either parent, whereas the latter are broader than in either.

The term heterosis is generally used to describe hybrid interactions in which some measurable feature is increased to such an extent in the hybrid that it exceeds both of the parents. Hybrid interactions sometimes result in the development of organs that are smaller than in either parent. It seems legitimate to regard these as examples of negative heterosis. The *R.* × *gordonianum* leaves are remarkable in that they exhibit both positive and negative heterosis in a single plant organ; positive heterosis in the breadth of the subterminal lobe and negative heterosis in the length of the main lateral lobes. This effect must be due to an interaction between the growth-control mechanisms of the parents, but it is not at once obvious how it can arise. Differences can be seen in the number and arrangement of the second-

ary nerves attached to the midrib and of the ternary nerves attached to the largest of the secondary nerves, which serves lobe III. The approximate courses of these secondary and ternary nerves is shown to the right of the leaf diagrams in fig. 4. In the discussion that follows it is convenient to regard the points of attachment of the secondary nerves to the midrib and of the ternary nerves to the lateral or secondary nerves, as well as the base O and apex A of the midrib, as nodes. The inter-neural intervals between these nodes may then be called neural internodes. The relative lengths of the neural internodes differ in the parent species. They reveal characteristic growth-patterns on which an explanation of the heterosis effects in the hybrids can be based.

The most striking differences occur between the neural internode-patterns of the main lateral nerve serving lobe III. In *R. odoratum* this usually has only three internodes, the first of which is short, the second much longer and the third about half as long as the leaf itself. Occasionally, there is a fourth internode, which is then quite short. It appears that the growth-rate was low at the base of the lobe, increases rapidly and then falls off very rapidly at the apex. This pattern is not fully developed along the midrib, which has but two internodes, the second of which accounts for about four fifths of the lamina-length. The growth-pattern of *R. sanguineum* differs in the larger number of neural internodes, The basal internode is relatively longer than in *R. odoratum* on both the lateral nerve and the midrib. Along the lateral nerve there is a gradual increase in the length of successive internodes, followed by a gradual decline, but the longest internode is only about one fifth of the leaf length. On the midrib, the first internode is longest of all, after which there is a gradual decline in length. (Table 1).

In the hybrid, the number of neural internodes is intermediate, but the pattern of internode-lengths indicates changes in the relative dominance of the parents. Along the lateral lobes, the first internode, although intermediate in length, tends towards *R. sanguineum*. The great increase in length of the second internode indicates partial dominance of *R. odoratum* which is maintained in decreasing strength in the third internode. The fourth internode about equals that of *R. sanguineum* and suggests partial dominance of that species towards the apex of the lobe, which in the terminal internode is reinforced by the influence of *R. odoratum* and results in a sharp decrease in length. On the midrib, the great increase of length from the first to the second internode and the more gradual decrease thereafter, indicates a similar change from partial dominance of *R. odoratum* at the base to partial dominance of *R. sanguineum* towards the apex of the leaf. The first internode, however, is shorter than in either parent, a feature that could be accounted for if the growth of the leaf stopped short at an earlier phase of development than in either parent. The intermediate number of internodes and the great length of the second and to a lesser degree of the third internode could then explain the attainment of a hybrid lamina-length almost as great as in *R. sanguineum*. Cessation of growth at an earlier phase of development would contribute to the negative heterosis in the length of the large basal lobe, but, alone, could not account for it. The principal interaction affecting the length of the lobe is concerned with the numbers of internodes and their relative lengths. Although *R. sanguineum* appears to be partially dominant in the first internode, this is so short that it has little effect in itself. Neverthe-

less, it seems likely that the growth processes of the whole lobe are predetermined at a relatively low level, nearer to those of *R. sanguineum* than to *R. odoratum*. In favour of this interpretation, all of the succeeding internodes

TABLE 1. Mean lengths of the neural internodes of the midrib and principal lateral nerve in Lobe III in *Ribes* leaves, expressed as percentages of the lamina-length.

	Lobe III, Wide side									No. of nerves	
	Internode No. from base									range	mean
	1	2	3	4	5	6	7	8	Total		
odoratum ...	3	26	54	9					92	3–4	3·3
gordonianum ...	5	20	22	19	6				72	3–5	4·3
sanguineum ...	6	15	19	18	12	7	3	0·5	80·5	6–8	7·1

	Lobe III, Narrow side									No. of nerves	
	Internode No. from base									range	mean
	1	2	3	4	5	6	7	8	Total		
odoratum ...	3	27	51	7					88	3–4	3·2
gordonianum ...	5	17	20	17	7				66	4–5	4·7
sanguineum ...	6	14	18	16	12	7	4	0·4	77·4	7–8	7·1

	Midrib								No. of nerves	
	Internode No. from base								range	mean
	1	2	3	4	5	6	7	8		
odoratum ...	21	79							2	2·0
gordonian ...	16	44	26	12					3–4	3·8
sanguineum ...	28	23	19	13	9	5	1·5		6–7	6·5

are, by comparison, rather short although they show some influence of *R. odoratum*. The third internode in *R. odoratum* accounts for 58 per cent of the length of the lobe, but in the hybrid the proportion is 30 per cent and in *R. sanguineum* 24 per cent. The relatively small excesses in length of the hybrid internodes over those *R. sanguineum* fail to compensate for the reduced number. The summation of these effects accounts for the negative heterosis.

It remains now to determine whether the positive heterosis in certain breadth-measurements can be explained by similar principles. For this purpose the lobes, numbered as in Fig. 4, will be considered in succession from the leaf-base to the apex. The breadths of the lobes (Table 2) are conveniently expressed as the angles they subtend at the point O, the node at the base of the midrib from which the polar co-ordinates were measured.

TABLE 2. Breadth of lobes of *Ribes* leaves expressed as the angle subtended at the base of the midrib, degrees. Lobe numbers and points as in Fig. 4.

	Lobe I small basal lobe			Lobe II median basal lobe			Lobe III large basal lobe		
	Between points 2–4			Between points 4–7			Between points 7–11		
	Wide side	Narrow side	mean	Wide side	Narrow side	mean	Wide side	Narrow side	mean
odoratum ...	9·7	9·9	9·8	19·2	19·2	19·2	41·0	39·1	40·1
gordonianum ...	9·9	7·1	8·5	16·5	17·6	17·1	45·3	44·0	44·7
sanguineum ...	2·7	4·8	3·8	18·1	20·3	19·2	44·8	47·8	46·3

	Lobe IV subterminal lobe			Lobe V apical segment			Lobe VI apical lobe		
	Between points 12–14			Between points 12–12			Between points 14–14		
	Wide side	Narrow side	mean	Wide side	Narrow side	mean	Wide side	Narrow side	Total
odoratum ...	9·2	8·8	9·0	14·8	14·1	28·9	5·6	5·3	10·9
gordonianum ...	10·4	10·8	10·6	20·2	21·3	41·5	9·8	10·5	20·3
sanguineum ...	8·3	7·2	7·8	22·9	21·2	44·1	14·6	14·0	28·6

The broadest lobe throughout the series is the large basal lobe (lobe III). If a rough comparison is made with *R. odoratum* it can be seen from Table 2 that the breadth-ratios of the first three lobes are, approximately, 2: 4: 10 in *R. odoratum*; 2: 4: 11 in *R. gordonianum*; 1: 4: 11 in *R. sanguineum*. So far as breadth is concerned, *R. odoratum* is partially dominant over the whole of the base of the hybrid leaf, although *R. sanguineum* is beginning to gain ascendency in the third lobe. The corresponding breadth-ratios for the apical segment, (lobe V) are *R. odoratum* 7, *R. gordonianum* 10, *R. sanguineum* 11, so that *R. sanguineum* becomes dominant in the distal parts of the leaf. The interaction in the apical segment can be analysed further, since it is built up of the lobe IV of either side and the apical lobe (lobe VI). In all three plants, lobe IV approaches a breadth ratio of 2, though slightly greater in *R. gordonianum* and slightly less in *R. sanguineum*. Lobe VI approximates to the breadth ratio 2 in *R. odoratum*, 5 in *R. gordonianum* and 7 in *R. sanguineum*. The breadth of the apical lobe in the hybrid is, therefore, more nearly intermediate than that of the apical segment as a whole. This must be due to a decline in the dominance of *R. sanguineum* and an increase in the effect of *R. odoratum* as the extreme tip of the leaf is approached, where its growth rate, as indicated by the internode lengths, declines very rapidly. The interaction producing positive heterosis in the breadth of lobe IV results from this change of dominance. Dominance by *R. sanguineum* in its proximal parts produces an apical segment almost as broad as in that species. The

change of dominance to *R. odoratum* results in an apical lobe narrower than in *R. sanguineum*. The difference between the apical segment and apical lobe is the sum of the breadths of lobe IV of either side. Since lobe IV in both parents and hybrid is apprimately equal in breadth, any decrease in the breadth of the apical lobe relative to *R. sanguineum* must, necessarily, result in lobe IV becoming relatively broader than in either parent.

Discussion

The proposition that 'hybrid leaves are intermediate in shape between those of their parents' was not realised in a direct form in any of the examples chosen for investigation. Varying degrees of interaction between the characters of the parents were observed and the intermediate appearance of the hybrid leaves appeared to be caused by a mosaic of dominant or partially dominant characters to which both parents contributed. These characters were not randomly disposed, but were regularly arranged and their effects were graded along the leaf-axis in such a way that the growth-patterns of the parents were more or less harmoniously blended. When one parent was dominant or had the major control of shape at the leaf-base, the other was dominant at the leaf-apex. In the intervening zone intergrading took place in a uniform manner. Thus, the most regular feature of leaf-shape interactions in the hybrids studied was this intergrading of parental characters along the leaf-axis. If this is the normal type of leaf-shape interaction in hybrids, as seems likely, a hybrid leaf that was exactly intermediate would represent a limiting case. The degree of dominance of shape characters varies greatly, but when the growth mechanisms of the parents are balanced an exactly intermediate shape should then result.

Among the hybrids examined, *Prunus* × *fontanesiana* was the only one in which a simple, axial intergradation of the parental characters was observed without complication by some other phenomenon. Axial intergradation was present on the *Rhododendron* hybrid, but each parent was dominant in that part of the leaf in which its own leaves were broadest. The hybrid leaf, in comparison with its length, was throughout relatively broader than either parent. This was not a simple size effect, since the actual length is intermediate, exceeding the mean of the smaller parent by only 40 per cent of the difference between the two. It seems justifiable therefore to regard this shape, effect as a form of heterosis. That the dominant features of the parents are completely integrated and uniformly balanced is shown by the comparison of the hybrid leaf-shape with the calculated intermediate (Fig. 3 B, D). Recalculation of the co-ordinates of the hybrid as an arithmetical series with the maximum breadth co-ordinate reduced to the same value as that of the theoretical hybrid produced curves representing leaf-margin shapes that were almost coincident (Fig. 3 D, full and dotted curves). The two sets of curves, therefore, were related as members of an arithmetic series. Variation of this kind is well known in *Ulmus*. It was first observed by Lindquist (Lindquist, 1932) in *U. glabra* Huds. and was later discussed by Melville (Melville, 1946, 1949) in relation to *U. carpinifolia* Gled, and *U. coritana* Melville. The virtual coincidence of the recalculated curves in this example indicates that the hybrid is balanced in the sense defined above, but is modified by a positive heterosis on the character of leaf-breadth.

The manner in which heterosis arose in the *Rhododendron* hybrid by the inheritance of the mechanisms controlling the broadest parts of the leaf of each parent, suggests that in other circumstances the mechanisms responsible for the development of the narrower parts might also be inherited together. This could occur by the segregation of recessive genes in F_2 or later generations in a hybrid population. In field studies, hybrids are occasionally found with leaves smaller than in either parent. Although no such plants have yet been measured, it seems likely that they are examples of the postulated converse effect. Negative as well as positive heterosis may therefore be distinguished. The plant-breeder is normally seeking for positive effects and is not interested in the negative aspects of heterosis phenomena. Dwarf, backward plants due to negative heterosis would be discarded with other runts resulting from faulty cultivation and other causes.

The *Ribes* hybrid is of particular interest in relation to the concept of positive and negative heterosis outlined above. Intergradation along the leaf-axis of partially dominant characters from both parents can be distinguished on two sets of criteria related to growth in length and in breadth respectively. Whether judged by neural internode-length as the criterion for length or by the angular breadth of the lobes measured from the basal node as that of breadth, *R. odoratum* was dominant at the base of the leaf and *R. sanguineum* at the apex. The development of the heterosis effects can be attributed to a comparatively large discrepancy between the growth patterns of the two *Ribes* species. In the pinnately nerved leaves investigated, as in the majority of pinnately nerved leaves, there is a gradual increase in the length of successive neural internodes along the midrib from the base towards the middle of the leaf followed by gradual decline to the apex. The harmonious integration of rather similar pairs would not appear to be difficult in the hybrids of compatible species. The growth-patterns of the currants was best expressed by the neural internode-lengths of the large lateral nerve-serving lobe III (Table 1). In *R. sanguineum* they increase gradually from the base and then decrease gradually with a more rapid decrease in the extreme apex. *R. odoratum* starts with a small neural internode, this is followed by very large increases and then a great decrease in the apex. These patterns are truncated along the midrib, especially in *R. odoratum* where only two neural internodes develop. Of these, the first is relatively long and the second accounts for 79 per cent of the lamina-length. *R. sanguineum* has its basal internode the longest after which successive internodes decrease rather uniformly. The integration of these rather discordant patterns is achieved in the hybrid by an intermediate number of neural internodes with the lengths adjusted by the grading of relative dominance of the parents along the leaf-axis. The major cause of the shortness of lobe 3 amounting to negative heterosis was the smaller number of neural internodes, which were of intermediate length. A contributory factor may have been the fact that the smaller leaved parent, *R. odoratum*, was partially dominant in the basal parts of the leaf. This may have determined at a relatively low level the possible size attainable by the hybrid leaf. By contrast it may be noted that positive heterosis on leaf-breadth developed in the *Rhododendron* hybrid, in which the parent with the broader leaf-base was dominant in the basal parts. In the *Ribes* hybrid positive heterosis on the breadth of the subterminal lobe resulted from an interaction that could be

traced to other marked discrepancies between growth-patterns of the parents.

Although on first inspection *Forsythia* × *intermedia* appeared to be a straightforward intermediate, it was found to exemplify yet another type of hybrid interaction. By calculating theoretical shapes for parental leaves from the hybrid and the other parent on the assumption that the theory of hybrid intermediacy was true, nonsensical results were obtained. This led to an examination of the terminal leaflets of the trifoliolate leaves of *F. suspensa*. The simple leaves of the hybrid were found to be exactly intermediate in shape between the simple leaves of *F. viridissima* and the terminal leaflets of *F. suspensa*. From this is would appear that the simple leaves of *F. viridissima* are equivalent to the terminal leaflets of *F. suspensa* rather than to its simple leaves. The validity of this conclusion can be justified on other grounds.

Forsythia is a member of the *Oleaceae*, which includes plants with either simple leaves or compound pinnate leaves and others, including *F. suspensa*, in which both kinds of leaf occur. Not infrequently pinnate leaves are found with one or both of the subterminal leaflets fused with the terminal leaflet. When fusion occurs, the base of the leaflet becomes rounded instead of cuneate. With a unilateral fusion, the terminal leaflet has a base rounded on one side and cuneate on the other. All of these conditions can be found in leaves of *F. suspensa*, but, as it never has more than three leaflets, when both subterminal leaflets fuse with the terminal, a simple leaf results. In a group of plants possessing compound pinnate leaves, simple leaves could be evolved either by successive fusions, as in *F. suspensa*, or by the suppression of all lateral leaflets until only a terminal leaflet remains. The evidence suggests that in *F.* × *intermedia* the simple leaved condition has been arrived at by suppression of lateral leaflets, presumably by the action of genes inherited from *F. viridissima*.

Comparable examples of suppression of all lateral leaflets were illustrated by Warren (Warren, 1931) in a study of hybrids and back crosses between *Venidium wyleyi* Harv. and *Arctotis stoechadifolia* Berg. Both plants have pinnate to pinnatipartite leaves. Various leaf-shapes appeared in the segregates from the F_1 some of which had the appearance of the terminal lobe of the leaves of the *Arctotis* parent. Some of the back crosses to *Arctotis* produced leaves having the general shape of the terminal lobes of the *Venidium*. Both of these had petioles without any extra lobes or leaflets, though other back crosses had the rachis ornamented to varying degrees with small or medium sized lobes. The leaves of the *Arctotis* parent had fewer and more widely spaced lobes than those of the *Venidium*. Evidently, the growth-patterns of the parents were sufficiently discordant to interfere almost completely with one another, except for the terminal lobe, in some of the segregants and back crosses. Regarded from the point of view of heterosis, these deletions of parts of leaves might be considered as the ultimate stage of negative heterosis.

Summary

1. The proposition, that the leaf-shapes of hybrids are intermediate between those of their parents, was examined metrically in four examples chosen from the genera *Forsythia*, *Prunus*, *Rhododendron* and *Ribes*.

2. No exact intermediates were found in which the hybrid interaction was uncomplicated with some other phenomenon.
3. The simplest type of interaction was an intergrading of characters along the leaf-axis, one parent being partially dominant towards the leaf-base and the other towards the apex, as in *Prunus* × *fontanesiana*.
4. The parental effects were equally balanced in the *Rhododendron* hybrid, but there was positive heterosis on the character of relative leaf-breadth.
5. In the *Ribes* hybrid axial intergrading was complicated by negative heterosis on the lengths of the large basal lobes of the leaf and positive heterosis on the breadths of the subterminal lobes.
6. The *Forsythia* hybrid was found to have a leaf-shape exactly intermediate between the leaves of the simple leaved parent and the terminal leaflets of the other parent which had both simple and trifoliolate leaves.
7. The concepts of positive and negative heterosis are discussed.

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Bible plants illustrated.—The chief regret of one who consults this attractive volume* must be that the illustrations were not reproduced in colour—for surely the originals were not executed in monochrome. No doubt the price would then have been prohibitive for most pockets, whereas the present very good twenty-five shillings' worth will make it a practical proposition for many. Binding, paper, print and general production leave little to be desired. Most of the illustrations are very pleasing, giving an excellent idea of the plants figured, and conveying all the information that the average non-botanical enquirer is likely to need. A few—e.g. the almug tree (*Pterocarpus santalinus*, p. 14) and the cinnamon (*Cinnamomum zeylanicum*, p. 56)—have a curious air of unreality about them, and one may be pardoned for suspecting here a little 'cookery'; whilst others, such as the camphire (*Lawsonia inermis*, p. 46) and the wormwood (*Artemisia judaica*, p. 236), have evidently suffered in definition in the process of photographic reproduction.

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* *All the plants of the Bible*. By W. Walker. Pp. 244, colour frontispiece, 114 monochrome plates. London: Lutterworth Press, 1958. Price 25/-.

The text is perhaps less successful than the plates, though a good deal of useful and interesting information is given. The artist has leaned heavily on the encyclopaedic work of the Moldenkes, although she does not explicitly refer to their *Plants of the Bible* (1952) or to any other authority. Her selection of information sometimes strikes one as capricious or uncritical. Why, under galbanum (*Ferula galbaniflua*, p. 86), which, she says, 'grows from Syria to Persia', does she trouble to give us the Sanskrit and even Singhalese names?! The artless statement, under 'spices' (*Astragalus tragacantha*, p. 194), that 'there are over twenty varieties' of 'astragal', makes us lift our botanical eyebrows. It was certainly not from the Moldenkes' scholarly volume that she culled the old-wives' tale (which she appears to repeat in all good faith) that the rose of Jericho (*Anastatica hierochuntica*, p. 174), 'blown about . . . as a "rolling thing", will at last come to rest and, with the help of a little moisture, *take root again*. Then its dried stems unroll. *Tiny flowers* and *fresh green leaves* appear on them . . .'! (Our italics). Incidentally, something seems to be seriously wrong with the fruits—or flowers?—in the drawing: the plant appears to be bearing hawthorn berries! We are surprised to read Miss Walker's estimate of the odour of coriander seeds (p. 60) as 'sharp though pleasant': to most of us it is just plain bugs!

More seriously, we cannot but feel regret that the authoress perpetuates certain lame attempts to 'explain away' Biblical miracles, such as the suggestion that the burning bush (p. 44) of Exodus 3 was *Loranthus acaciae* growing on an acacia bush, or that the manna (p. 241) was either a lichen (*Lecanora*) or a blue-green alga (*Nostoc*). And we find the suggestion that the 'weeds' that Jonah encountered in the fish's belly were *Zostera marina* (p. 243) wholly unconvincing. It is good, however, to see the 'apple' (p. 22) clearly identified as the apricot (*Prunus armeniaca*), and there are many other equally illuminating determinations. On the whole, this book will fill a real want among popular works on Bible natural history at the present time, and as such—with the needful *granum salis*—may be recommended.

H. K. Airy Shaw

The Flora of Arnhem Land.*—This volume is the third of a series recording the scientific results of the American-Australian Expedition of 1948 to the Arnhem Land Aboriginal Reserve in Northern Australia. Great credit is due to Dr. R. L. Specht for preparing such an interesting and comprehensive account of the botanical work of the expedition, which embraced all groups of plants. The collection of marine algae was the first obtained from the area and there was only one previously of freshwater algae. Desmids were the most numerous group of freshwater algae with 130 species and 87 varieties, many of which are illustrated by line drawings. The task of naming the cryptogamic groups and certain small groups of angiosperms was undertaken by specialists, but Dr. Specht was responsible for the bulk of the flowering plants, which numbered over 1,300. The systematic record for each species includes the localities and numbers of the specimens, the ecological formation, life form of the plant and its Australian and, where appropriate, extra-Australian distribution. The novelties described and

* *Records of the American-Australian Scientific Expedition to Arnhem Land.* Volume 3: Botany and Plant Ecology, edited by R. L. Specht and C. P. Mountford. Pp. xv + 522, 17 plates, 77 figures and maps, 20 tables. London: Cambridge University Press and Carlton, Victoria: Melbourne University Press. Price £6. 6. 0.

figured include 15 species and 6 varieties, one of the most interesting being a second species of *Blepharocarya* (*B. depauperata* Specht) which extends the range of the genus considerably. The presentation of the material is generally excellent, though an exception was noted in *Borreria*. The reasons why changes of epithet are necessary on transferring *Spermacoce auriculata* F. Muell. and the two varieties of *S. laevigata* F. Muell. to *Borreria* are not stated. Under the present rules of nomenclature one of the varietal names in its new combination is invalid. Also a new varietal name appears to have been omitted under *B. brevifolia* (F. Muell. ex Benth.) Specht. A short chapter provides a list of the plants collected by Dr. H. Basedow on the Mackay Expedition to Arnhem Land in 1928. These determinations had not previously been published and add something to our knowledge of the flora. Although it is stated that members of the staff at Kew were responsible for these identifications this is not strictly true. The majority were named by Mr. W. D. Francis, subsequently Government Botanist at Brisbane, during his visit to Kew in 1930. The original determinations of the ferns were by Dr. Carl Christensen of Copenhagen. Another short chapter, in which W. Bateman collaborated, gives an account of the vegetation in the Mt. Marumba area of Central Arnhem Land, which was not visited by the expedition. A most readable account of the climate, geology, soils and plant ecology follows, each plant formation being illustrated by a photograph. The ecological information is summarised in an extensive table, which lists all the species and their occurrences in the eleven major vegetation communities recognised by the author. A coloured vegetation map shows the distribution of these communities within the Arnhem Land Reserve. The penultimate chapter is a stimulating discussion of the geographical relationships of the Arnhem Land flora. Perhaps less than justice is done here to the Wegener theory of continental drift, for no mention is made of recent work on palaeomagnetism, which is favourable to a drift theory. The probable movements of Australian vegetation zones during the Tertiary period are expounded in some detail and illustrated by maps. The present relationships of the Arnhem Land flora are summarised in another large table, which lists the distribution of each species within 10 floral regions within Australia and in 10 extra-Australian regions. The final chapter on ethnobotany is based on published work supplemented by the observations of members of the expedition. It links the flora with the human population and so brings fittingly to a close this valuable contribution to our knowledge of the Australian flora.

R. Melville

The care of lawns.*—A clear and detailed account of the preparation and upkeep of lawns, particularly suitable for the suburban gardener. Nearly every operation described is illustrated by a photograph or line-drawing. The title is somewhat misleading, as the treatment of sportsgreens is too cursory to do justice to this important subject.

W. D. Clayton

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* *Lawns and Sportsgreens.* By W. N. Lawfield. Pp. 84, 12 half-tone plates (29 photographs), 16 text-figures. London: W. H. & L. Collingridge Ltd., 1959. Price 12/6.

Saxifrages from Brandon Mountain, Co. Kerry

E. M. Marsden-Jones and W. B. Turrill

Over thirty years ago we used one of the 'mossy saxifrages' in hybridization experiments and the results were published in Journ. Gen. **23**, 83–92 (1930). At intervals since then we have made further experiments and have studied populations of several mossy and other saxifrages, some in the wild and some over long periods of cultivation. Our last paper on the group was published in Journ. Gen. **54**, 186–193 (1956). Professor D. A. Webb has also carried out extensive investigations on the section *Dactyloides* of the genus *Saxifraga* and two of his valuable papers were published in Proc. Roy. Irish Acad. **53**, sect. B., No. 12, 207–40 (1950) and in Watsonia **2**, 22–9 (1951). On the taxonomic side our findings and those of Professor Webb are in general agreement and, like him, we record considerable variation within some populations. It is true that many of these plants are highly plastic as regards both physiological and morphological characters That is to say, the same genotype can show considerable phenotypic variation in reaction to different environmental conditions. This plasticity is best tested by the use of ramets of one clone. On the other hand, there is variation within a population which is based on differences in genotypes and on growing the same stocks (maintained by cloning) over two to three decades we have noted their relative constancy as expressed by differences from one stock to another. It has been thought worth while to publish a short note on this for 13 plants (Nos. 17 to 29) collected on Brandon Mt., Co. Kerry, by Dr. R. W. Butcher, and sent to us on 18 June 1936, and for 4 plants (Nos. 30–33) collected on the same mountain by Mr. J. E. Lousley and received by us on 11 June 1937. These plants have been cultivated and observed at Potterne and Lavington, Wilts., and some of them at Kew, Surrey, since these dates, apart from a few that failed to survive the whole period. The majority of the plants did not flower very freely any year, either in Wiltshire or at Kew. The special interest is the retention of the main taxonomic characters and the differences between stocks under cultivation for two decades or longer. Some of the characters and character differences are easy to describe but others are more subtle and difficult to express adequately in either figures or words. The Brandon population, as a whole and in general terms, we would place under *Saxifraga rosacea* Moench.

Details of plants.

Nos. 17–29, collected by Butcher, June, 1936.

No. 17. Flowering stems 4·5–6·5 cm. Many barren shoots. Rosettes fairly loose. Rosette-leaves mostly 3-lobed (from 1– up to 5-lobed), 9–10 mm. × 5–7 mm., lobes relatively deep and narrow. Flowers 1 to 3 (per flowering stem). Petals 10 × 7 mm., 4 to 5 veins.

No. 18. Flowering stems 3–7·5 cm., slender. Many barren shoots. Rosettes fairly loose. Rosette-leaves mostly 4–5-lobed (from 1- to 8-lobed), 7–9 mm. × 4–7 mm. Flowers 2 to 3. Petals 9 × 5·25 mm., 3 veins with often faint lateral branches to lateral veins.

No. 19. Flowering stems 2–7 cm., slender. Barren shoots present. Rosettes fairly compact. Rosette-leaves mostly 3–4-lobed (from 1- to 5-lobed), less deeply lobed, 7–8 mm. × 5–6 mm. Flowers 1 to 4. Petals 8 × 5 mm., 3 veins, no side veins.

No. 20. Flowering stems 3·5–7 cm., slender. Barren shoots present. Rosettes fairly compact. Rosette-leaves mostly 3–4-lobed (from 1- to 9-lobed), less deeply lobed, 7–9 mm. × 4–8 mm. Flowers 2 to 4. Petals 8 × 5 mm., 3 veins, no side veins.

No. 21. Flowering stems 2·5–5 cm. slender. Barren shoots many. Rosettes compact. Rosette-leaves mostly 3–4-lobed (from 1- to 5-lobed), less deeply lobed, 9–10 mm. × 5–6·5 mm. Flowers 3 to 4. Petals 8 × 5 mm., 3 veins, no side veins.

No. 22. Flowering stems 2·5–3·5 cm., few produced. Many barren shoots. Rosettes compact. Rosette-leaves mostly 3-lobed (1- to 5-lobed), 6–7 mm. × 4–5·5 mm. Flowers 2. Petals 8 × 5 mm., 3 veins, no side veins.

No. 23. Flowering stems 4–8 cm., slender. Many barren shoots. Rosettes fairly loose. Rosette-leaves mostly 3–4-lobed (1- to 7-lobed), 6–10 mm. × 5–6 mm., lobed relatively long and narrow. Flowers 3–4. Petals 8 × 4 mm., 3 veins, no side veins.

No. 24. Flowering stems 5–9 cm., slender. Many barren shoots. Rosettes fairly compact. Rosette-leaves mostly 3–4-lobed (1- to 5-lobed), lobes often strongly acute, 7–10 mm. × 4–6 mm. Flowers 2–4. Petals 9 × 5 mm., 3–5 veins. (Very like S.P.4).

No. 25. Flowering stems 4–6·5 cm., slender. Many barren shoots. Rosettes rather variable in compactness. Rosette-leaves mostly 3–4 lobed (1- to 5-lobed), 9–10 mm. × 6–8 mm. Flowers 1–3. Petals 8·5 × 6·5 mm., 3 veins, laterals much branched.

No. 26. Not flowering. Many barren shoots with rather variable rosettes. Rosette-leaves mostly 3-lobed (1- to 5-lobed), 7–11 mm. × 3·5 × 7 mm.

No. 27. Flowering stems 4·5–7 cm., slender. Many barren shoots, tending to grow out. Rosette-leaves mostly 4–5-lobed (1- to 6-lobed), 8–10 mm. × 4–8 mm. Flowers 1–4. Petals 8·5 × 5 mm., 3 veins, some side veins.

No. 28. Flowering stems 1·5 to 8 cm. long. Many barren shoots which tend to grow out. Rosettes rather loose. Rosette-leaves mostly 3- to 4-lobed (1- to 7-lobed), 7–10 mm. × 3–7 mm., lobes relatively long and narrow and acute. Flowers 1 to 4. Petals 9 × 6 mm., 3 veins, with some lateral branches.

No. 29. Flowering stems 1·5 to 3 cm. Many barren stems. Rosettes compact. Rosette-leaves mostly 3-lobed (1- to 5-lobed), 7–9 mm. × 4–6 mm. Flowers per stem 2. Petals 8 × 5 mm., 3 veins, no side veins.

Nos. 30 to 33, collected by Lousley, June, 1937.

No. 30. Flowering stems 2 to 5 cm. Few barren stems. Rosettes compact. Rosette-leaves mostly 3–4-lobed (1- to 5-lobed), 11–12 mm. × 5–8 mm. Flowers 1–3 per stem. Petals 8 × 4 mm., 3 veins, no side veins.

No. 31. Flowering stems 2 to 5 cm. Some barren stems. Rosettes compact. Rosette-leaves mostly 3–4-lobed (1- to 6-lobed), 7–10 mm. × 4·5–9 mm. Flowers 1–2 per stem. Petals 8·5 × 5·5 mm., 3 veins, occasionally lateral veins with side veins.

No. 32. Flowering stems 4 to 6 cm. Some barren stems. Rosettes compact, in older plant somewhat looser. Rosette-leaves mostly 3- to 4-lobed (1- to 5-lobed), 9–12 mm. × 5–7 mm. Flowers 3–4 per stem. Petals 10 × 5 mm., 3 veins, no side veins.

No. 33. Flowering stems 2 to 3 cm. Some barren stems. Rosettes compact to slightly growing out. Rosette-leaves mostly 3-lobed (1- to 5-lobed), 7–8 mm. × 3.5–5 mm. Flowers 1–3 per stem. Petals 9 × 5 mm., 3 veins, no side veins.

All the plants have rather long distinct hairs on the leaves, especially on the margins, but have no, or at most very few, glandular hairs. The long hairs are often more or less lost in the older leaves. The most striking variation from stock to stock is in the degree of compactness of the plants as a whole and of the individual rosettes. Extremes are the compact plants Nos. 21, 22, 29, 31, and 32 as contrasted with the more or less loose plants Nos. 17, 18, 26, 27, 28. In most plants the leaf-lobes of rosette-leaves are best described as subacute to acute, though on individual lobes of old leaves the apex may be somewhat rounded. An exception is plant No. 28 in which the leaf-lobes are mostly strongly acute to shortly acuminate. Plant No. 24 has also strongly acute leaf-lobes. The petals of most of the plants have three major veins. The two lateral veins may or may not have side branches. Up to 5 main veins occur in at least some of the petals of Nos. 17 and 24.

In several ways the most aberrant plant is No. 28. The plant is loose in habit owing to the many barren stems which tend to grow out making the rosettes themselves loose. The rosette-leaves have relatively long and narrow lobes which are mostly strongly acute to shortly acuminate. The petals, however, have three main veins with the laterals sometimes with branches.

Our findings support the main conclusions of Professor Webb and confirm the accounts of and the determinations we have used in our earlier papers on saxifrages. There is just the suggestion that the population of mossy saxifrages on Brandon Mountain owes some of its variation, which is in part genotypic, to past introgression of genes from some other species, perhaps *Saxifraga hypnoïdes* L., though we have no plants from Brandon Mountain we would place in that species.

A new species of *Aristolochia* from the island of Samos

W. B. Turrill

The majority of species of *Aristolochia* are tropical or subtropical in range but a number occur in temperate and warm temperate regions including the Mediterranean Basin and several are recorded for the Aegean area. Dr. C. N. Goulimis has sent good flowering material of one he collected in April 1959 in Samos and what is evidently to be accepted as the same species was collected in 1940 by Dr. P. H. Davis in probably the same locality. Otherwise Goulimis's material has not been matched with any specimens at Kew or with any published descriptions and is here described as a new species under the name *Aristolochia samia*.

The type material has a strong superficial resemblance in habit and general appearance to some forms of *Convolvulus arvensis*. Below ground there is a cylindrical structure extending downwards more or less vertically and either of rhizomic nature or wholly or in part a tap root. From the upper part of this there arise numerous slender stems which evidently grow through the substratum as slender rhizomes for distances of up to 1 dm. before emerging. They bear scale-leaves (cataphylls) in the subterranean portions and these show transitions to foliage-leaves near where they reach the soil-surface.

Boissier, Flora Orientalis **4**, 1075–82 (1879), records 19 species of *Aristolochia* from the Nearer East, none, however, from the island of Samos. Our plant appears to come nearest to the species in which the perianth has an expanded limb and non-climbing stems and several of these must be mentioned. *A. tournefortii* Jaub. & Spach is known, amongst other localities, from Chios both as var. *tournefortii* and var. *macroglossa* (Jaub. & Spach) Boiss. It has, however, leaves with blades of a different shape from those of *A. samia* and a perianth with narrow lamina and a straight tube. *A. hirta* L. is a plant with erect stems and leaves and flowers very much larger than those of *A. samia*. It is recorded from Chios and P. H. Davis also collected it on Samos (in shady places, Pyrgos, 29 April 1940, *P. H. Davis* 1611 in Herb. Kew.). *P. auricularia* Boiss., from Caria and Lycia, has densely hairy leaves and straight perianth-tubes.

Aristolochia samia *Turrill*, sp. nov. a *A. tournefortii* Jaub. et Spach foliis breviter hispidulis laminis ovato-triangularibus, perianthii lamina late elliptica tubo curvato praecipue recedit.

Herba perennis, ramis numerosis in parte inferiore subterraneis deinde plus minusve prostratis tenuibus usque ad 1·6 dm. longis in parte superiore crispo-puberulis, internodiis 5–10 mm. longis. *Folia* spiralia; lamina ovato-triangularia, apice rotundata breviter apiculata, basi profunde cordata lobis basalibus subrotundatis, usque ad 2·2 cm. longa et 1·6 cm. lata, margine integra leviter undulata, utrinque breviter hispidula, in pagina adaxiale costa leviter canaliculata, in pagina abaxiale costa nervisque prominentibus;

petiolus 2–3·5 mm. longus, leviter puberulus. *Flores* in foliorum axillis singuli; pedicellus saepe plus minusve curvatus, circiter 1 cm. longus, crispopuberulus; receptaculum (ovarium inferum) oblique anguste ellipsoideum, 4 mm. longum, 3 mm. diametro, brevissime hispidulum, longitudinaliter costatum. *Perianthium* 3·5 cm. longum, curvatum, tubo 1·5 cm. longo subspherico in parte superiore cylindrico, lamina late elliptica valde concava apice rotundata 2 cm. longa 1·5 cm. lata in pagina interiore superne longe pilosa nervis valdis longitudinalibus 5 instructa. *Gynostegium* subsphericum 2 mm. altum. *Stamina* 6, gynostegio adhaerentia; antherae (dehiscentes) 0·5 mm. longae, 1 mm. latae. *Stigmata* antheris aequalia.

Samos. Pyrgos, shady banks, 300 m., 29 April 1940, *P. H. Davis* 1609:—flowers dark blackish brown; leaves rather glaucous; root long, cylindrical. East of the road from Vathy to Pyrgos, at a point about 29·5 km. from Vathy, 11 April 1959, *C. N. Goulimis* (typus in Herb. Kew.).

Contributions to a Growth Symposium.—This volume* includes 10 papers presented at the Seventeenth Symposium of the Society for the Study of Development and Growth, held in 1958 at Mount Holyoke College, Massachusetts. The theme of the symposium was 'differentiation and growth in response to a changing chemical environment', and the distinguished contributors from the United States, Germany and England have approached this vast field of research from their different biological viewpoints, using a variety of skills.

The tools of biochemistry, cytology, embryology and morphology have been ingeniously combined to solve problems of growth control and movement in unicellular organisms, isolated cells, embryos and multicellular plants and animals. The techniques of tissue culture and the application of hormones are the instruments most generally used.

Of particular interest is the account of the work at Long Ashton on the relationship between fruit development and auxins. The elegant contribution of J. G. Torrey must also be singled out for mention. By upsetting the usual developmental processes through changes in the external or internal environment, he has been able to analyse and interpret the normal course of development in the root in terms of cell divisions and the biochemical factors controlling their location, direction and occurrence. Dr. Torrey draws attention to the frequency of polysomaty in the higher plants and discusses the evidence of correlation between polyploidy and tissue differentiation.

In these days of extreme specialisation, it is encouraging to see such a range of biological topics encompassed within one dust jacket. Only the concerted efforts of biologists trained in different disciplines will elucidate the common processes of development and the modifications leading to abnormal growths.

M. Y. Stant

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* *Cell, Organism and Milieu.* Ten papers read at the Seventeenth Symposium of the Society for the Study of Development and Growth. Edited by D. Rudnick. Pp. 326, 60 half-tone figures, 53 black and white figures, 32 tables. New York: The Ronald Press Company, 1959. Price $8.

Studies in the *Ericales*: XII*

A FEW NEW OR NOTEWORTHY AGAPETES FROM THE CALCUTTA HERBARIUM

H. K. Airy Shaw

Since the completion of my last paper on *Agapetes* (K.B. **13**, 466–512: 1959), I have been able, by the courtesy of the Director of the Botanical Survey of India, to examine some of the material of this genus preserved in the Herbarium of the Calcutta Botanic Garden. The present short contribution presents notes on the more interesting gatherings found in the consignment. The numbers prefixed to each species correspond to those used in the above paper.

Series ROBUSTAE

Subser. Coriaceae

3. **Agapetes marginata** *Dunn*; Airy Shaw in Kew Bull. **13**, 469 (1959).

Abor Hills. Above Upper Rengging Camp, 1140 and 1530 m., 28 Jan. 1912, *Burkill* 36340: 'In flower, different to the one which grows below. It has a tuberous root a foot long and about 5 inches in diameter—fusiform. Epiphytic; flowers on thick stems ¾ inch thick, warted.' (Type, Herb. Calc.; dupl. in Herb. Kew.).

The type-specimen in the Calcutta Herbarium shows that the leaves are definitely pseudo-verticillate.

6a. **Agapetes toppinii** *Airy Shaw*, sp. nov., *A. hillii* Brandis et *A. megacarpae* W.W.Sm. arcte affinis, sed foliis minoribus, pedicellis sursum valde incrassatis, calyce majore segmentis longioribus, corolla longiore vix vel obscure anfractuoso-vittata differt.

Suffrutex epiphyticus? statura ignota. *Rami* 3–4 mm. crassi, laeves, glabri, pallidi, inferne teretes, superne obtuse angulati. *Folia* dissita, haud pseudo-verticillata, elliptica, rarius oblanceolata, 8·5–9·5 cm. longa, 2·2–2·7 cm. lata, basi abrupte truncato-rotundata, apice acuta, haud acuminata, margine levissime dissite indentata vel subintegra, chartacea, glabra, nitidula, siccitate supra fusca subtus rubido-brunnea; costa modice valida, utraque pagina prominula, nervis secundariis gracilibus adscendentibus in nervum gracilem submarginalem conjunctis, nervulis reticulatis utraque pagina prominulis; petiolus subnullus. *Inflorescentia* ut in *A. hillii* et *A. megacarpa* pseudo-terminalis, 3 cm. longa, 2 mm. crassa, angulata, glabra, nutans, ut videtur multiflora (in specimine unico cicatricibus saltem 20 florum delapsorum vel abortivorum visibilibus, sed floribus tantum 4 suppetentibus), bracteis subulatis 2–3 mm. longis acutissimis minute ciliolatis persistentibus. *Pedicelli* 2·5–2·8 cm. longi, superne valde incrassati, ut videtur carnosuli, glabri, haud evidenter angulati, apice breviter cupulatim expansi 6–7 mm. lati. *Receptaculum* 8 mm. latum, 4–5 mm. longum, glabrum. *Calycis* segmenta subulata, 12–13 mm. longa, basi 3–4 mm. lata, brevissime connata, valde parallele nervosa, apice acuta, erecta, glabra. *Corolla* cylindrica, 4·5–5 cm. longa, 8–9 mm. diametro, angulata, ut videtur apicem tantum versus

* Continued from Kew Bull. **13**, 512 (1959).

obscure transverse anfractuoso-vittata (colore ignoto), lobis triangulari-subulatis 8 mm. longis acutis apice (alabastro stigmati adpresso) quasi cucullatis. *Stamina* (specimine plagulae nimis arcte adglutinato necnon adsuto) praeter medium et apicem haud visa, corollae fere aequilonga, filamentis sine dubio brevissimis, antheris longissime rostratis, rostris paullo supra medium breviter calcaratis. *Stylus* corollam paullo excedens, in stigma truncato-capitatum sensim ampliatus. *Fructus* ignotus.

Upper Burma. Khampti Long Mission: Usan, 375 m., Nam Tesang, 750 m., Jan. 1912, *Capt. S. M. Toppin* 6018 (type, Herb. Calcutta).

The significance of the *two* localities and altitudes given on the label is not clear, since there is only one specimen on the sheet. Possibly the plant was thought to have been seen twice, but was only once collected.

Agapetes hillii Brandis (Bhamo distr.), *A. megacarpa* W.W.Sm. (SW. Yunnan), and the present species, form a small group distinguished by the apparently (though not truly) terminal position of the inflorescence. *A. megacarpa* is known from two gatherings, but *A. hillii* and *A. toppinii* from only a single gathering each, and therefore nothing can be said concerning their range of variation. *A. toppinii* is on the whole closer to *A. megacarpa* than to *A. hillii*. Its most conspicuous features are perhaps its thickened pedicels and large calyces.

9. **Agapetes sikkimensis** *Airy Shaw* in Bull. Misc. Inf. Kew **1935**, 29 (1935), et in Kew Bull. **3**, 85, fig. 1 (1948).

E. Himalayas. Raiotdong to Santok, 750–1800 m., 27 June 1903, *Major F. E. Younghusband* s.n. (Tibet Frontier Commission).

Also the following rather poor specimen in the British Museum (Nat. Hist.):—

Bhutan. Mirichoma, Timpu, in moist forest, 1200 m., 21 Nov. 1914, *R. E. Cooper* 3677: 'Large epiphyte'.

It is interesting to see further gatherings of this apparently local species, hitherto known only from the three early collections of J. D. Hooker and C. B. Clarke from the Teesta and Yankeung in Sikkim.

22a. **Agapetes aborensis** *Airy Shaw*, sp. nov., *A. salicifoliae* C.B.Cl. affinis, sed foliis duplo latioribus inflorescentiis dense brevissime brunneo-glanduloso-setulosis distincta.—*A. setigera* D. Don sec. Burkill in Rec. Bot. Surv. Ind. **10**, 52, 94, 311 (1924–25), non D. Don ex G. Don.

Suffrutex parvus epiphyticus. *Caules* 30–40 cm. longi, parum ramosi crassiusculi, 3–5 mm. diametro, rugosi, juniores angulosi, cortice laevi glabro fusco. *Folia* manifeste pseudo-verticillata, anguste elliptica usque oblanceolata, 8–11 cm. longa, 2·3–6 cm. lata, inferne sensim cuneato-attenuata, apice acuta, haud vel vix acuminata, integra, rigide coriacea; costa modice valida, utraque pagina prominens, rete nervorum conspicuo prominulo pulchre reticulato, nervis late patentibus in nervum marginalem conjunctis; petiolus brevissimus, rugoso-incrassatus, saepe pruinosus, vel subnullus. *Inflorescentiae* abbreviatae, circiter 1 cm. longae, 2–8-florae, pedunculo pedicellis receptaculis dense brevissime brunneo-glanduloso-setulosis, bracteis parvis triangularibus acutis denticulatis. *Pedicelli* 5–6 mm. longi. *Recepta-*

culum parvum, 1–1·5 mm. diametro. *Calycis* segmenta lanceolato-subulata, 3–5 mm. longa, acuta, nervosa, parce glanduloso-setulosa. *Corolla* anguste cylindrica, 1·6–1·8 cm. longa, 3–3·5 mm. diametro, angulata, glabra, vel angulis parce setulosa, atrosanguinea, lobis ovatis brevissimis 1 mm. longis. *Filamenta* circiter 2 mm. longa, oblonga, glabra. *Antherae* 1·4 cm. longae: thecae oblongae, 5 mm. longae, asperatae, basi breviter caudatae; rostra 9 mm. longa, laevia, dorso 3 mm. supra basin minutissime calcarata. *Stylus* corollam aequans, glaber, stigmate capitato. *Fructus* ignotus.

Assam. Abor Hills: Rengging, 690 m., 25 Jan. 1912, *Burkill* 36250: 'Epiphyte with dark crimson flowers and thick leaves, growing on *Altingia*.' Serpo Valley, S. side, 450 m., 29 Jan. 1912, *Burkill* 36382 (leafless): 'Epiphyte, common, with fleshy root and pendent flowers'. Rengging, 19 Feb. 1912, *Kalka Pershad* 36639 (typus, Herb. Calcutta). [No. 36302 of the Abor Expedition, cited by Burkill, *l.c.* 311, with the foregoing numbers, under *Agapetes setigera*, represents a different, though indeterminable, species: see below.]

Though closely related to the otherwise somewhat isolated *Agapetes salicifolia* C.B.Cl., this appears to be a quite distinct species. It is unfortunate that very few corollas remain on the specimens, and several of these are poorly preserved. The brown glandular-setulose indumentum of the inflorescences—suggestive of that found in some of the Series *Longifiles*—is very distinctive. The vestigial spurs on the backs of the anther-beaks are very minute. Upon re-examination of the flower of *A. salicifolia* dissected by C. B. Clarke, I was interested to find a similar, though even more minute, vestigial spur on the back of one of the ten anther beaks. Owing to the presence of these spurs, these two species would run down in my recently published key (K.B. **13**, 467–8) to *A. odontocera* (Wight) Hook.f., and the leaf-texture and venation would support an actual relationship with that species.

Agapetes sp. nov.? aff. *A. aborensi* Airy Shaw?

Burma. Upper Chindwin, 1800 m., 1 May 1915, *J. M. D. Mackenzie* 38.

This specimen has flowers very like those of *A. aborensis*, especially in the dense brown glandular-setulose indumentum of the pedicels and calyx and in the shortly spurred anther-beaks. Unfortunately only one mature flower, a bud and two empty calyces are preserved, and the axis of the inflorescence is missing. The leaves, however, are quite different from those of *aborensis*, being thinner in texture, distinctly and distantly serrulate, and abruptly rounded at the base into a very short petiole. The serrulation is suggestive of that of *A. odontocera* (Wight) Hook.f., but the other characters are widely different. The material is scarcely adequate for description.

Agapetes sp. nov.? aff. *A. variegatae* (Roxb.) D. Don ex G. Don vel *A. aborensis* Airy Shaw?—*A. setigera* D. Don sec. Burkill in Rec. Bot. Surv. Ind. **10**, 311 (1925), quoad *Burkill* 36302, non D. Don ex G. Don.

Assam. Abor Hills, spur above Rengging Camp, 1260 m., 26 Jan. 1912, *Burkill* 36302.

Upper Burma, Khampti Long Mission: Nam Tesang, 750 m., Feb. 1912, *Capt. S. M. Toppin* 6305.

In these two imperfect specimens (which may not be conspecific) the leaves are superficially very like those of *A. aborensis*, though somewhat narrower (1·7–2·9 cm. wide) and with a less well-defined marginal nerve. No flowers are present on *Burkill* 36302, but on *Toppin* 6305 two flowers, with two further empty calyces, still remain. These are quite unlike those of *aborensis*, being completely glabrous, and appear to place the plant rather in the neighbourhood of *A. variegata* (Roxb.) D. Don ex G. Don.

Series GRACILES

Subser. Longifoliae

1. **Agapetes neriifolia** (*King et Prain*) *Airy Shaw* var. **minor** (*King et Prain*) *Airy Shaw* in Kew Bull. **13**, 489 (1959).

Desmogyne minor King et Prain in Ann. Roy. Bot. Gard. Calcutta, **9** (1), 47 (1901), *in obs.*

Upper Burma. Hukung Valley Survey Expedition: at Nongong Ford, between Patkoi and Digum Hill, 1895–6, *J. Wallace* (type, Herb. Calc.).

The type specimen of King & Prain's *Desmogyne minor* is found to agree in all essentials with the two gatherings of Kingdon Ward (21302 and 21330) referred to this form in my last paper. Ward's specimens have more numerous-flowered inflorescences and longer and slenderer pedicels, but without a greater range of material available I am disinclined to attach special significance to this.

Subser. Parvifoliae

17. **Agapetes serpens** (*Wight*) *Sleumer*; Airy Shaw in Kew Bull. **13**, 497 (1959).

E. Nepal. Pheda to Charikot, ± 1950 m., 27 Apr. 1948, *Banerji* 623.

This is only the second known gathering of *A. serpens* from Nepalese territory. Unfortunately the corolla has fallen from the only flower present on the specimen, and it is therefore not possible to say whether it shows the same differences of size and colour as the previous one (see Airy Shaw, *l.c.*).

In your garden with Percy Thrower.*—This book by Percy Thrower, well known for his gardening programmes on television and radio, is intended to help those who want to remember to do all the necessary operations in the garden at the right time.

In simple language the author gives clear and accurate directions on how and when to do things week by week throughout the year. Brief cultural details are given for plants, crops and fruits accompanied by photographic illustrations which clearly show the author performing many of the operations described, in his own garden and greenhouse.

This book, by a man who has devoted his life to horticulture, should prove a welcome addition to the library of any amateur gardener.

H. S. Marshall

* *In Your Garden with Percy Thrower*. By P. Thrower. Pp. 160, many half-tone illustrations. London: W. H. & L. Collingridge Ltd., 1959. Price 15/-.

Some *Discomycetes* described by Rick from south Brasil

R. W. G. Dennis

In 1906 and again in 1931–2 Dr. J. Rick published a number of new species of *Discomycetes* collected around São Leopoldo in the state of Rio Grande do Sul, Brasil, i.e. at a fairly low altitude in approximately 30°S. latitude. No figures were provided and the descriptions were seldom adequate for recognition of the fungi by other workers; indeed few, if any, of Rick's *Discomycetes* have been recorded again. His herbarium is now preserved at Collegio Anchieta, in the nearby town of Porto Alegre, in the care of Father B. Rambo, who has most kindly permitted me to borrow and examine such material as remains of the types of *Discomycetes*. Though the collections are now well cared for they have obviously suffered considerable damage in the past. Many of his species can no longer be traced in Rick's herbarium, a number of packets which remain no longer contain a fungus corresponding to his description and in those which have survived the hymenium has sometimes been much damaged by insects. Nevertheless, enough remains for supplementary information to be secured regarding 16 of Rick's new *Discomycetes*. As is inevitable with a mycologist working in such isolation, a number of his species prove to be synonyms of older fungi with a wide distribution. Rick was obviously a careful and conscientious mycologist but experience shows that his spore measurements were not entirely reliable. Hence they cannot be relied upon in any attempt to recognise those species of which the types have entirely disappeared.

In the following notes the species are described in the order in which they appear in Rick's 'Monographia Pezizinearum Riograndensium', in which his observations on Brasilian *Discomycetes* were finally collected. The numbers quoted are those adopted on Father Rambo's modern typed labels. No numbers or localities were cited in Rick's diagnoses but the specimens in his herbarium are all accompanied by labels in his writing bearing the name, usually the locality, e.g. 'S. Leop.', the collector's name, 'Rick' or 'Braun' and are often annotated by him 'Typus' or are accompanied by a manuscript diagnosis. The authority of such material as survives is therefore not in doubt. Unfortunately two species, *Lachnum distinguendum* Rick and *Mollisia brasiliensis* Rick, only survive in the Rick herbarium as collections made subsequent to publication and to which unpublished varietal names have been attached. They are described below but their authority in interpretation of the typical varieties of these two species is obviously dubious.

Chlorosplenium olivaceum *Rick* in Broteria, Serie Botanica **25**, 98 (1931)

Herb. Rick. 12793, 'In ligno frondoso, São Leopoldo, 1929, *Braun*, typus'.

Apothecia superficial on rather hairy woody stems, scattered, black throughout when dry, very dark olive brown when soaked up; disc flat or slightly convex, immarginate; receptacle very soft, smooth, seated on a short, smooth, cylindrical stalk which may be central or excentric. Surface of

receptacle formed of thinwalled, brown, subglobose cells, 10–14μ diameter; flesh dark brown and so agglutinated the structure cannot be clearly discerned, even in thin sections, that of the stalk, however, is composed of parallel dark brown hyphae. Asci narrowly clavate, delicate, 100 × 9μ, 8-spored, iodine reaction uncertain; ascospores uniseriate below, biseriate above, fusiform or inequilateral, 18–27 × 3μ, nonseptate; paraphyses slender, obtuse. There is no purple stain or other colour change with KOH or ammonia. Fig. 1.

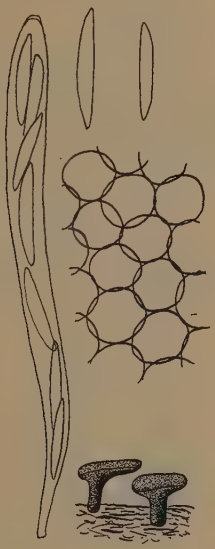

FIG. 1. *Chlorosplenium olivaceum*. Two apothecia, × 3; ascus, spores and excipular cells in surface view, × 660

FIG. 2. *Lachnum distinguendum* var. Apothecium, × 12; hairs, ascus, paraphysis and spore, × 660

Rick described ascospores 30–50 × 4μ and hence suggested an affinity with *Holwaya gigantea* (Peck) Durand. In structure, texture and habit the species recalls *Phialea uleana* Rehm but has quite different spores.

Sclerotinia myrtaceae *Rick* in Egatea **13**, (not seen)

Herb. Rick. 14839, 'Sclerotinia myrtacearum Rick, in fructibus Myrtaceae, N. Petropolis, 1909, *Rick*.'

Only a stalk of an apothecium remains, long and slender, dark reddish brown to almost black at the base, composed of broad, rather short-celled, very thinwalled soft hyphae, 8–10μ wide, the surface bearing minute, unicellular, thinwalled, downy hairs about 10 × 4μ. There is no trace of a sclerotium though the woody tissue of the fruit appears slightly blackened. This can hardly have been an *Helotium* and, though in the absence of a sclerotium it cannot be a *Sclerotinia*, it should probably be transferred to

Ciboria. It will be seen below that Rick used the generic name *Ciboria* erroneously for species belonging to *Helotium* subgenus *Hymenoscypha*.

Trichobelonium virgineum *Rick* in Broteria **5**, 224 (1906)

Herb. Rick. 15202, 'In Palma, São Leopoldo, 1905, *Rick*, typus'.

This is *Arachnopeziza aurata* Fuck., as already indicated by Korf (1951).

Sarcoscypha concatenata *Rick* in Broteria **5**, 32 (1906)

Herb. Rick. 14856, 'In ligno, São Leopoldo, 1905, *Rick*'.

The packet contains only the remains of a single apothecium, seated directly on the decorticated wood of a small twig, of *Pinus* according to the diagnosis. The hymenium has been totally destroyed and it is, therefore, impossible to add to the published description beyond stating that the excipulum is composed throughout of hyaline hyphae 3–4μ wide.

Lachnum distinguendum *Rick* in Broteria **5**, 33 (1906)

The type is apparently lost and the specimen forwarded, Herb. Rick. 21046, is labelled 'Lachnum distinguendum var capitata cum setulis capiti ovato nec ramosis', with the additional data 'S. Salvador, 28.1.1944. Legit et det. Rick' supplied by Rambo.

Apothecia gregarious on the surface of dead bark; disc about ½ mm. diameter, drying yellowish-orange, concave; receptacle cupulate, clothed with short white hairs, stalk slender, cylindrical, about as long as the diameter of the disc. Hairs cylindrical, up to 55 × 3μ, apex sometimes enlarged to 6μ diameter, hyaline, thin-walled, septate, surface minutely granulate. Asci cylindric-clavate, 40–44 × 4–5μ, 8-spored, pore minute, blued by Melzer's reagent; ascospores mostly uniseriate, sometimes biseriate above, narrowly fusiform, 6–7·5 × 1–1·5μ, nonseptate; paraphyses 4–4·5μ wide, lanceolate, thinwalled, protruding up to 30μ beyond the asci. Fig. 2, p.115.

The hairs of the type were described as 'Apice angustatis, crystalliferis, ramosis.' It is perhaps fortunate that Rick's specific epithet cannot be transferred to *Dasyscypha* because of the prior existence of *D. distinguenda* (Karst.) Sacc. 1889.

Lachnum olivaceo-sulphureum *Rick* in Broteria **5**, 34 (1906)

Herb. Rick. 13874, 'In ligno frondoso, São Leopoldo, 1904, *Rick*, typus'.

The material is abundant, well preserved, and in macroscopic characters agrees closely with the diagnosis. The hairs are cylindrical, obtuse, up to 110 × 4μ, septate, with thin brown walls, hyaline towards the tip, bearing rather widely spaced relatively large round granules and small loose lumps of yellow matter. They liberate a magenta stain in ammonia. Excipular cells isodiametric, 6μ diameter, with thin brown walls. Asci cylindrical, short-stalked, 45–50 × 4μ, 8-spored; ascospores elliptic-fusiform, uniseriate, 3·5–4·5 × 2μ; paraphyses cylindrical with pointed tips, 2μ wide, scarcely longer than the asci. Fig. 3.

FIG. 3. *Lachnum olivaceo-sulphureum*. Apothecium and section, × 10; hair, ascus, paraphyses and spore, × 660

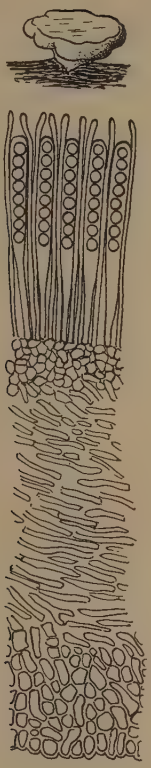

FIG. 4. *Lachnellula calva*. Apothecium, × 10; section, × 660

As this is a holotype in good condition it affords an opportunity of checking the reliability of Rick's microscopic measurements:

	Rick	Dennis	*D. cerinus* Dennis (1949)
Hairs ...	100 × 5μ	up to 110 × 4μ	up to 110 × 4μ
Asci	50 × 6μ	45–50 × 4μ	40–50 × 4–5μ
Ascospores ...	5–7 × 3–4μ	3·5–4·5 × 2μ	4–5 × 2–2·5μ
Paraphyses ...	3–4μ	2μ	2μ

It will be seen that the measurements of the larger organs, hairs and asci, are reliable but those of the ascospores are not and the widths of narrow organs are exaggerated. The fungus is obviously quite typical *Dasyscyphus cerinus* (Pers.) Fuck. but the error in spore size in the diagnosis is sufficient to have prevented this identification being apparent until the material was re-examined.

Lachnellula calva *Rick* in Broteria **5**, 34 (1906)

Herb. Rick. 22045, no data beyond the name in Rick's hand.

Apothecia gregarious, erumpent from bark, yellowish brown throughout, disc up to 2 mm. across, flat with an upturned margin; receptacle rather thick, pruinose, margin often lobed, seated on a short stout stalk. Flesh 3-layered, with a small-celled subhymenium about 20μ thick, a median layer about 50μ thick composed of subparallel hyphae 2μ wide, and an outer cellular layer about 30μ thick, the cells with rather thick hyaline walls. Asci cylindrical, stalked, with rounded tips, 45 × 4μ, not blued by Melzer's reagent, 8-spored; ascospores uniseriate, globose, hyaline, 2·5μ diameter; paraphyses cylindrical with rounded tips, 1μ thick, a little longer than the asci. Fig. 4, p.117.

Clearly this is a *Midotiopsis* and very like *M. bambusicola* P. Henn. 1902, though it is not on bamboo. The type collection of *M. bambusicola* was from the state of Santa Catharina, only about 250 miles north of São Leopoldo, and it seems best at present to regard *L. calva* as synonymous with it, in spite of the difference in substrate.

Dasyscypha bambusae *Rick* in Broteria, Serie Botanica **25**, 104 (1931)

Herb. Rick. 13093, labelled 'Bambusa, São Leopoldo, 1931, *Rick*'.

Apothecia gregarious, superficial; disc ½ mm. wide, flat with raised margin, orange; receptacle shallow cupshaped, drying buff but clothed with white hairs, stalk rudimentary. Hairs cylindrical but tapering slightly to the rounded tip, up to 80 × 5μ, sparingly septate, very thinwalled and collapsing when dried, finely granulate; asci narrowly cylindric-clavate, 55–65 × 6μ, pore blued by Melzer's reagent; ascospores biseriate, fusiform or inequilateral and slightly curved, (17)–20–23 × 1·5–2μ, with several guttules; paraphyses cylindrical, up to 2μ wide with pointed tips but scarcely longer than the asci. Fig. 5.

A copy of the diagnosis in Rick's hand is enclosed in the packet containing the specimen and from this it is clear that the spore measurement, 12–14 × 6μ, in the published diagnosis is not a printer's error. The fungus present otherwise agrees tolerably with the diagnosis and I cannot suggest how this discrepancy arose.

D. bambusae is distinct from any of the South American species studied by Dennis (1954) and the ascospores are more fusiform than those of *D. hyalopus* (Cke. & Massee) Dennis (1958). From *D. emerici* (Berk. & Phil.) Sacc., on twigs in India, it is probably sufficiently distinguished by its much shorter stalk and different substrate.

Dasyscypha sulphurea *Rick* in Broteria, Serie Botanica **25**, 105 (1931) non *D. sulphurea* (Pers. ex Fr.) Massee, Brit. Fungus Flora **4**, 352 (1895)

Herb. Rick 19687, 'In ligno frondoso = Helotium ambiguum Herbarii, São Leopoldo, 1930, *Rick*.'

Apothecia superficial, sessile, solitary or in small clusters; disc flat, drying deep yellow, with slightly raised white rim; receptacle cupshaped, often lobed, smooth, white. Flesh and excipulum composed throughout of inter-

woven, thickwalled, hyaline hyphae, which turn outwards at a high angle to the surface on the flanks of the receptacle. Asci cylindric-clavate, up to 80 × 6μ, pore not blued by Melzer's reagent, 8-spored; ascospores elliptic-fusiform or inequilateral, 9–11 × 2·5μ, 1-septate; paraphyses cylindrical with rounded tips, 2μ thick. Fig. 6.

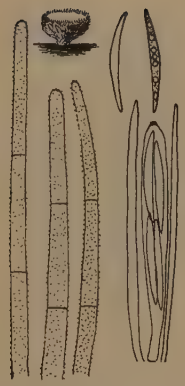

FIG. 5. *Dasyscypha bambusae*. Apothecium, × 12; hairs, ascus, paraphyses and spores, × 660

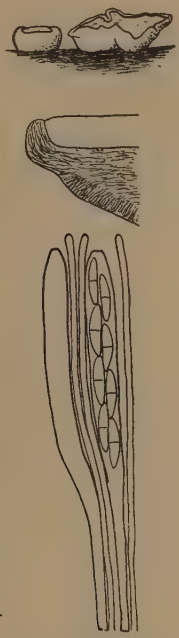

FIG. 6. *Dasyscypha sulphurea*. Apothecia, × 10; diagrammatic section, × 50; asci and paraphyses, × 660

This is a *Calycella*, identical with '*Niptera*' *subiculata* Seaver 1924 and probably with *C. discedens* (Karst.) Dennis, the type of which came from Minas Geraes. It is odd that Rick referred his fungus to *Dasyscypha*, especially as he did not describe hairs in it, as he did with most of his genuine species of *Dasyscypha* and *Lachnum*, but merely stated the apothecia to be 'extus albo-lanuginosis'. Possibly he was misled by the whiteness of the excipulum or he may have seen free tips of the excipular hyphae in a squashed preparation and regarded these as hairs. The label apparently indicates that he later considered he had described the fungus twice, as a *Dasyscypha* and as an *Helotium*. The two diagnoses appear in the same paper in 1931.

Helotium irregulare *Rick* in Broteria, Serie Botanica **25**, 110 (1931)

Herb. Rick. 13213, 'São Leopoldo, 1939, cotyp. Juni'.

Apothecia solitary or in pairs on decorticated wood, superficial; disc up to 4 mm. wide, flat or slightly convex with a shallow umbilicus, dull reddish-

brown when dried; receptacle thin, margin often lobed and recurved, stalk short but well defined and slender, dark brown, especially at the base. Flesh white, formed of loosely woven hyaline hyphae, excipulum composed of compact parallel hyphae 3μ wide, lying at a very low angle to the surface. Asci cylindric-clavate, 55 × 4–5μ, 8-spored; ascospores biseriate, clavate, 6–8 × 1·5–2μ; paraphyses cylindrical, 1μ thick, obtuse, no longer than the asci.

If the date quoted has been correctly read this cannot be cotype though it may be considered authentic for the name. The fungus is identical with *H. cupreum* Bres. 1896, or at least with material sent by Rick to Bresadola and so named by the latter in the Stockholm herbarium. As Rick described the apothecia as 'albo-hyalinis aut flavidis' it appears that the disc is whitish when fresh and only assumes its coppery hue when dried. If so, both *H. irregulare* Rick and *H. cupreum* Bres. ought probably to be reduced to synonymy under *H. leucopse* (Berk. & Curt.) Le Gal.

Helotium luteum *Rick* in Broteria, Serie Botanica **25**, 110 (1931)

Herb. Rick. 13232, 'In ligno, São Leopoldo, 1929, typus, *Rick*'.

Apothecia gregarious, superficial, yellow, drying deep yellowish-brown throughout; disc flat, 4 mm. diameter; receptacle cupshaped on a small base, smooth, soft. Flesh composed of compact, slender, subparallel hyphae, passing towards the surface into a small-celled tissue 30–40μ thick, with isodiametric cells 5–6μ diameter. Asci narrowly cylindric-clavate, 160 × 11μ, apex truncate, not blued by Melzer's reagent, 8-spored; ascospores mostly uniseriate, elliptic-fusiform or tapering below, with 3 or more guttules, hyaline, 19–23 × 5–6–(8)μ, occasionally becoming 1-septate; paraphyses slender, cylindrical, obtuse, up to 2μ thick, sometimes forked. Fig. 7.

This is a *Phaeohelotium* in the sense of Dennis (1958), resembling *Helotium lutisedum* (Karst.) Karst. but with slightly larger and broader ascospores than any of the species known to me.

Helotium chromoflavum *Rick* in Broteria, Serie Botanica **25**, 114 (1931)

Herb. Rick. 13200 '1929, *Braun*, São Leopoldo'.

According to the diagnosis this was 'In foliis Myrtacearum'. The packet now contains pieces of at least two different leaves, one coriaceous on which no trace of apothecia can be seen, the other membranaceous, bearing a single complete apothecium and two similar stalks from which apothecia have been lost. In Mr. Sandwith's opinion neither leaf is Myrtaceous. Rick complicated the situation by referring to a var. *purpurea* Rick, 'Differt disco brunneo-purpureo et paraphysibus minus et obscurius coloratis. Simul cum typo in iisdem foliis.' The following description relates to the surviving apothecium.

Apothecium solitary, superficial, black throughout when dried, dark brown when soaked up; disc flat, about 1 mm. diameter; receptacle obconical, smooth, very soft, stalk slender, smooth, concolorous. The material is too scanty to be sectioned but the margin appears to be composed of very thinwalled parallel hyphae. Asci cylindric-clavate, 60–70 × 6μ, 8-spored,

Fig. 7. *Helotium luteum*. Apothecia × 5; ascus, paraphysis, spores and section of excipulum, × 660

Fig. 8. *Helotium chromoflavum*. Apothecium, × 10; ascus, paraphysis and spores, × 660

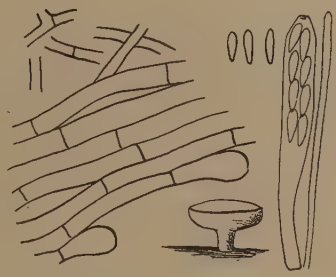

Fig. 9. *Helotium vile*. Apothecium, × 5; ascus, paraphysis, spores and section of excipulum, × 660

iodine reaction uncertain; ascospores biseriate, elliptic-fusoid, hyaline, 8–9 × 2–2·5μ, conspicuously biguttulate; paraphyses cylindrical, obtuse 2μ thick. Fig. 8.

Superficially this resembles *H. phlebophorum* Pat. but has quite different spores. If Rick's statement that the spores are 'subflavis' means they become coloured at maturity the fungus may be a *Lambertella*. There are black lines in the dead leaf but not in close association with the apothecial stalks. In view of the poverty of the material it seems undesirable to express any opinion on the true taxonomic position of *H. chromoflavum*.

Helotium vile *Rick* in Broteria, Serie Botanica **25**, 114 (1931)

Herb. Rick. 13216, 'In foliis, São Leopoldo, 1929, *Rick*'.

Apothecia scattered, superficial; disc about 1 mm. diameter, flat or slightly convex, reddish-brown when dried, light yellowish when soaked up; receptacle saucer-shaped, very minutely pruinose, brownish when dried, light yellow with a brown margin when soaked up, stalk short but well defined and

slender, smooth, brown. Flesh of very loosely woven hyaline hyphae, 2·5–3μ wide; excipulum about 30μ thick, formed of compact, hyaline hyphae, 4–5μ wide, lying at a very low angle to the surface and terminating in protruding pyriform, thinwalled cells 15–20 × 6–7μ. Asci clavate, about 55 × 6–7μ, 8-spored, pore blued by Melzer's reagent; ascospores biseriate, slightly clavate, hyaline, nonseptate, 6–8 × 2μ; paraphyses cylindrical, obtuse, 2μ thick. There are black patches on the lower surface of the leaf but they do not appear to be closely associated with the apothecia or to penetrate to the upper surface in the form of stromata. Fig. 9, p.121.

H. vile is very like *H. caracassensis* Dennis in habit, stature and structure but all collections of the latter were whitish, the disc drying yellowish, where as *H. vile* was described as 'griseo-olivaceis' throughout. I therefore hesitate to adopt Rick's name for the venezuelan fungus at present.

Phialea leopoldina *Rick* in Broteria, Serie Botanica **25**, 117 (1931)

Herb. Rick. 15015, 'In foliis, São Leopoldo, 1929, *Hansen*, typus'.

Apothecia solitary, superficial, on fragments of bark; disc yellow, flat, up to 3 mm. diameter; receptacle shallow cup-shaped, sessile on a small base, slightly scurfy-pruinose, now almost black, purplish-brown when fresh according to Rick. Excipulum composed of about 4–5 layers of subglobose cells, 10–13μ across, with thin, dark brown, nonencrusted walls, not yielding a stain in ammonia. Asci narrowly clavate, 70 × 5–6μ, 8-spored, pore blued by Melzer's reagent; ascospores uniseriate, elliptic-cylindric or often slightly allantoid, hyaline, nonseptate, 7–9 × 2–2·5μ; Paraphyses cylindrical, obtuse, 2μ thick. Fig. 10.

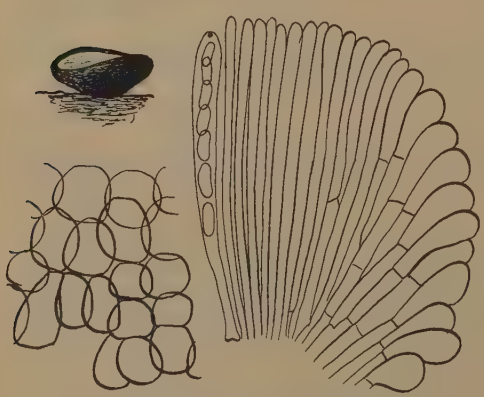

FIG. 10. *Phialea leopoldina*. Apothecium, × 6; section of margin and portion of excipulum from the flanks of the receptacle, × 660.

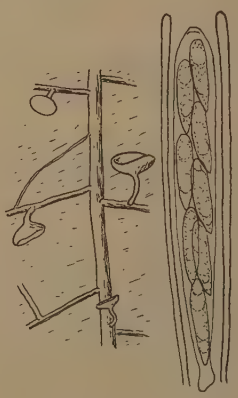

FIG. 11. *Ciboria minima*. Habit sketches, × 10; details, × 660

This is an *Encoelia*. The species was published as 'ad detriti' and the statement 'in foliis' on the label is apparently a lapse on Rick's part. The fragments of his 15015 are wrapped in paper which bears on one side a manu-

script copy of the published diagnosis but with the name 'Phialea Leopoldinis', and on the other side the name 'Phialea Leopoldensis', apparently also in Rick's hand. The published version of the name was *Phialea leopoldina*.

Ciboria minima *Rick* in Broteria, Serie Botanica **25**, 119 (1931)

Herb. Rick. 12644, 'In foliis, São Leopoldo, 1929, *Braun*.'

Apothecia scattered, superficial, arising from veins on the underside of a dead leaf; disc about ½ mm. diameter, concave to flattened, probably whitish when fresh, now light yellowish brown; receptacle cupshaped, concolorous, smooth, with a slender stalk as long or longer than the diameter of the disc. The material is too scanty to be sectioned but the excipulum appears to be Helotiaceous, with parallel, hyaline, thinwalled hyphae, about 3μ wide towards the margin. Asci narrowly clavate, about 80 × 10μ, 8-spored, the pore feebly blued by Melzer's reagent; ascospores biseriate, narrowly elliptical, more pointed below, with 2 or more oil drops, hyaline, nonseptate, 15–17 × 3·5–4μ; paraphyses slender, cylindrical, obtuse, 1·5–2μ thick. Fig. 11.

This seems to be *Helotium albopunctum* Peck 1879.

Ciboria cerea *Rick* in Broteria, Serie Botanica **25**, 119 (1931)

Herb. Rick. 12645, 'In foliis, extus albiore, *Braun*, 1929, L.', presumably 'L' signifies São Leopoldo.

Apothecia scattered, superficial, on veins on the underside of a dead leaf, of 'Tiliaceae (Inhea)' according to the diagnosis; perhaps *Luhea* was intended. Disc about 1 mm. across, flat with slightly raised rim, now almost black; receptacle saucer-shaped, smooth, concolorous, with a long, slender, smooth stalk. Flesh thin, formed of loosely woven hyphae; excipulum of compact, parallel, hyphae 2μ wide, lying at a low angle to the surface. Asci 70–80 × 7μ, 8-spored, the pore feebly blued by Melzer's reagent; ascospores biseriate, elliptic-cylindric, pointed below, usually with two large oil bodies but nonseptate and hyaline, 13–16 × 3–3·5μ; paraphyses cylindrical, obtuse, 2–2·5μ wide. Fig. 12, p.124.

This differs from any European or American species known to me, though it is clearly closely allied to the preceding and to *H. phyllogenon* Rehm, which lacks the oil bodies in the ascospores. It may be transferred to *Helotium* as **H. cereum** (*Rick*) *Dennis*, comb. nov.

Desmazierella bulgarioïdes *Rick* in Broteria, Serie Botanica **25**, 119 (1931)

Herb. Rick. 13094, 'In ligni frondosi, Tanenwald, 1905, *Rick*, typus.'

This is an *Ombrophila* parasitised by a Dematiaceous mould. The ascospores described, (hyaline, 15–20 × 5μ, Rick; 13–16 × 4—5μ, Dennis), are those of the *Ombrophila*. The hairs on the receptacle and interspersed among the paraphyses, which led Rick to refer the species to *Desmazierella*, are conidiophores of the mould. The entire flesh is permeated by the brown hyphae of the parasite. The name is to be rejected as having been based on a mixture of two discordant elements.

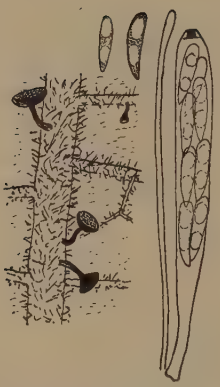

FIG. 12. *Ciboria cerea*. Habit sketches, × 10; details, × 660

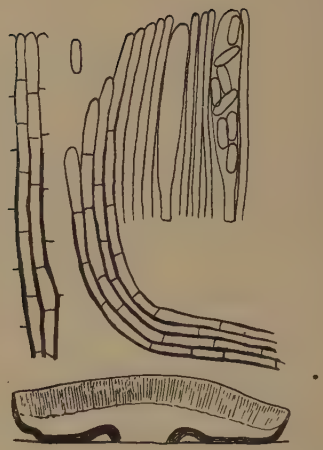

FIG. 13. *Mollisia brasiliensis* var. Diagrammatic section, × 100; section of margin and strip of excipulum in surface view, × 660

Mollisia brasiliensis *Rick* in Broteria, Ciencias Naturais **1**, 39 (1932)

Herb. Rick. 14209, 'Mollisia brasiliensis Rick var. olivacea, Dy (?) 39, Rick, Palmar'

Apothecia scattered on the inner surface of bark, superficial, with no trace of a subiculum; disc flat or slightly convex, olive-gray, ½ mm. diameter; receptacle discoid, black, smooth, sessile, attached by a small central area. Flesh thin, white, solid; excipulum composed of parallel vertical hyphae, 3–4μ wide, with rather thick, dark-brown walls and thin septa, slightly paler near the margin. Asci cylindric-clavate, short-stalked, 50 × 5–6μ, 8-spored, pore not blued by Melzer's reagent; ascospores ± biseriate, elliptic-cylindric, hyaline, nonseptate, 7–8 × 2·5–3μ; paraphyses cylindrical, obtuse, 2μ thick, not forming a coloured epithecium. Fig. 13.

Rick 14209 is a *Durella* but no new combination in that genus is proposed here as it remains uncertain how far this number can be taken to illustrate the structure of the species. It is certainly not now 'extus albopuberulis' as the type was said to be.

Packets purporting to contain type material of the following species were forwarded from the Rick herbarium but in none of them could a fungus corresponding with the diagnosis be found, probably because of the depredations of insects in the past:

Cenangella bambusicola Rick, *Cyathicula brasiliensis* Rick, *Desmazierella foliicola* Rick, *Helotium viride-flavum* Rick, *Lachnum bambusicolum* Rick, *Ombrophila*

multiguttulata Rick, *Phialea mellea* Rick, *P. hemisphaerica* Rick, *Pirottaea bromeliacearum* Rick.

The following species cannot be traced today in the Rick herbarium at Porto Alegre:

Belonidium guttula Rick, *Beloniella bromeliacearum* Rick, *Belonopsis tropicalis* Rick, *Durella braunii* Rick, *Helotium ombrophiloïdes* Rick, *H. tectum* Rick, *Mollisia trametis* Rick, *Ombrophila ciliata* Rick, *Phialea euspora* Rick, *Trichopeziza aurea* Rick.

I am informed by Prof. Hultén that none of the above species are represented in the collections of the Naturhistoriska Riksmuseet, Stockholm, which houses the herbaria of Bresadola, Rehm and Sydow, with whom Rick corresponded. For the present, therefore, it is necessary to regard them as lost.

Datura among the scientists.*—Those who know the Thorn-Apple only from the recent spate of 'newspaper botany' may be surprised to learn that the genus *Datura* has received one of the most complete experimental studies ever made of a single group of plants. To quote a sentence from the foreword to this book, 'No other organism, not even *Drosophila*, has involved so many aspects of biology in its genetic investigation as has *Datura*'. These studies were carried out over a period of more than forty years by Dr. Albert F. Blakeslee (1874–1954) and his team of fellow-workers, and the present volume, which commemorates their originator, is a complete account of them, based on no less than 228 papers written between 1910 and 1956. Starting with genetic studies, the programme of research extended to a very wide range of problems, with the result that, 'few organisms have yielded such a wealth of scientific information as has come from this plebeian weed'. Successive chapters of this admirable, copiously illustrated summary deal with the history of the genus, its alkaloids, chromosome number and morphology, polyploidy, gene mutations, chimeras, seed development, the species problem, barriers to "crossability", and other related matters.

Chapter 2, the review of the taxonomic history of the genus, followed by a summary of *Datura* nomenclature between 1753 and 1958, is the least satisfactory part of the book, but we must remember that the experimental work was concerned only with the ten herbaceous species of *Datura*, not with the complex and beautiful arborescent forms of the Section *Brugmansia* and, in the writers' words, the review 'is not intended as a complete taxonomic study. No attempts are made to evaluate definitively or to revise the accepted classification of the species within the genus'. In truth, it carries us no further than the revision of Safford and other more recent treatments, and the problem of the interpretation of such a taxon as *D. chlorantha* Hook., which has been variously referred to Sections *Brugmansia* and *Dutra*, is not solved. Experiments and observations have led the writers to believe that there is some justification for treating *Brugmansia* as a separate genus. They do not commit themselves to any personal opinion on the question of the original home of Thorn-Apple.

N. Y. SANDWITH

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* *Blakeslee: the genus Datura.* By A. G. Avery, S. Satina and J. Rietsema, with foreword and biographical sketch by E. W. Sinnott. Pp. xli + 289, one portrait and 66 figures. New York: The Ronald Press Company, 1959. Price $8.75.

African Orchids: XXVII*

V. S. Summerhayes

This contribution contains a revision of the genus *Cyrtorchis* and reclassification of the genera *Diaphananthe* and *Rhipidoglossum*, and of *Holothrix* and *Deroemera*. A new section of *Habenaria* is proposed and 12 new species belonging to various genera are described. There are also several taxonomic and nomenclatural notes. The type specimens of the new species are in the Kew Herbarium unless stated otherwise.

Deroemera Rchb.f. and *Holothrix* A. Rich.

The genus *Deroemera* was founded by Reichenbach in 1852 (De Poll. Orch. 29) on plants collected by Schimper in Ethiopia. Later, when dealing with the genus *Holothrix* A. Rich. (Otia Bot. Hamburg. 119: 1881) he merged his genus with Richard's. In 1895, however, Rendle and Schlechter resuscitated the genus *Deroemera*, spelling it incorrectly *Deroemeria* (Journ. Bot. Lond. **33**, 277), stating that it differed from *Holothrix* in the distinct habit and the greater union of the labellum with the column. Rolfe adopted the genus in the 'Flora of Tropical Africa' (**7**, 195–197: 1898) and gave the same characters for distinguishing it from *Holothrix*. Judging from Rendle and Schlechter's comments the 'distinct habit' consisted in the occurrence of sheaths or cataphylls on the glabrous scape, these being said to be absent from the hairy scapes in *Holothrix*.

It is interesting to note that in Schlechter's revision of *Holothrix*, published only a short time after his re-adoption of *Deroemera*, there are included four species which are said to possess cataphylls or sheaths on the scape, viz.:—*H. schlechteriana* Kraenzl., *H. grandiflora* (Sond.) Rchb.f., *H. longiflora* Rolfe and *H. burchellii* (Lindl.) Rchb.f. In two of these species, *H. schlechteriana* and *H. burchellii*, the scape is glabrous in the upper part where the sheaths occur, whereas it is hairy at the base where there are no sheaths. It appears, therefore, that the presence or absence of sheaths, coupled with or without a glabrous or pubescent scape, can hardly be used as a character for separating the two genera, and Rendle and Schlechter's 'distinct habit' falls to the ground. This view is supported by the existence of *H. randii* Rendle, which is clearly a *Deroemera* on all external characters, but which closely resembles several species of *Holothrix* in perianth characters.

There still remains, however, the supposed greater union of the labellum with the column, also mentioned by Rendle and Schlechter and by Rolfe. On examination of material preserved in liquid I entirely fail to find this distinction. The degree of union admittedly is greater in some species than in others but there seems to be no correlation with the occurrence or absence of sheaths or with other floral characters.

Surveying all the species which have been included in *Holothrix* and *Deroemera* one finds much the same range of floral structure in both genera, from species with simple petals and labellum, such as in *Deroemera squammata* (Hochst. ex A. Rich.) Rchb.f. and in some forms of *Holothrix exilis* Lindl., up

* Continued from Kew Bull. **13**, 281 (1958).

to species in which the petals and labellum are divided in the upper part into a number of filiform segments, exemplified by *H. scopularia* Rchb.f. in which the scape is ebracteate and very hairy and by *H. randii* Rendle in which the scape is furnished with sheaths and quite glabrous and which is clearly referable to *Deroemera* as understood by Rolfe.

It therefore appears to me that the two supposed genera cannot be separated on any logical or satisfactory basis and I am accordingly merging the two under the earlier name *Holothrix*.

Holothrix arachnoïdea (*A. Rich.*) *Rchb.f.*, Otia Bot. Hamburg, 107 (1881), excl. descr.

Peristylus arachnoïdeus A. Rich. in Ann. Sci. Nat., sér. 2, **14**, 267 (1840)
Holothrix richardii Rolfe in Dyer, Fl. Trop. Afr. **7**, 191 (1897)

Rolfe was quite wrong in adopting the new epithet *richardii* for this species seeing that he cited Richard's name as a synonym. The plants which Reichenbach described when making the above combination may or may not be referable to the same species as Quartin-Dillon's original specimen, but that does not affect the application of the name which must go with the specimen described by Richard. Rolfe should have given a new epithet to his species No. 6 in the 'Flora of Tropical Africa'. In view of the frequent variation in the number of lobes on the petals and labellum in the genus *Holothrix* I am not prepared to give this latter species another epithet until I have examined the types. It may well be merely a 5-lobed variant of *H. arachnoïdea*.

Holothrix brachycheira *Summerh.*, sp. nov.; ab *H. nyasae* Rolfe bracteis minus pilosis, floribus minoribus, petalis papillosis sparsissime ciliolatis nec longe ciliatis, labello 5–7-lobato lobis papillosis tantum, calcari limbo aequilongo vel longiore facile distinguenda.

Herba terrestris, 15–30 cm. alta; tubera globosa vel ellipsoidea, 7–15 mm. longa, 5–12 mm. diametro, subdense tomentosa vel glabrescentia. *Caulis* brevissimus, 2-foliatus. *Folia* humistrata, sessilia, carnosa, subtus nerva mediana sparsissime pilosa excepta glabra, supra longe adpresse pilosa, marginibus longe ciliatis; inferius majus, late vel orbiculari-ovatum vel late orbiculare, apice apiculatum, basi ± cordatum, 1·5–3 cm. longum, 2–3·3 cm. latum; superius minus, late vel elliptico-ovatum, apice acutum vel apiculatum, 1·5–3 cm. longum, 1·2–1·7 cm. latum. *Scapus* erectus, gracilis, evaginatus, 15–30 cm. altus, 1–2 mm. diametro, teres, pilis tenuibus patentibus instructus. *Racemus* subdense multiflorus, 3–7 cm. longus, 5–10 mm. diametro; bracteae lanceolatae, acuminatae, ovario pedicellato breviores, longe pilosae et ciliatae. *Flores* secundi, breviter pedicellati, suberecti, partim virides partim albi; ovarium pedicellatum 2–4 mm. longum, ellipsoideum, dense pilosum. *Sepalum* intermedium late ovatum, breviter acuminatum, 1·5 mm. longum, 1·5–1·7 mm. latum, uninervium; sepala lateralia valde oblique ovata vel late ovata, margine antico basi valde dilatata, 1·75–1·9 mm. longa, 1·5–1·9 mm. lata, sub-binervia; omnia sepala extra pilosa et longe ciliata, viridia. *Petala* ambitu late cuneata, dimidio apicali trilobata, 2·2–2·3 mm. longa, 1·2–1·4 mm. lata, trinervia, alba, lobis lineari-oblongis obtusis (dactyliformibus) 0·6–1·3 mm. longis

minute papillosis, petalorum marginibus sparsissime ciliolatis vel revera longissime papillosis. *Labellum* e basi cum columnae adnata anguste flabellatum, dimidio apicali 5–7-lobatum, in toto 2·5–2·9 mm. longum, 2·4–2·7 mm. latum, album; lobi dactyliformes, obtusi, usque 1 mm. longi, minute papillosi; calcar e basi lata anguste conicum, apice leviter incurvatum, circiter 2·75 mm. longum. *Anthera* erecta, apice rotundata vel breviter apiculata, loculis parallelis, circiter 1·25 mm. longa.

Northern Rhodesia. Mwinilunga Distr., between Mwinilunga and Matonchi Farm, in *Brachystegia* woodland on sand, Jan. 1938, *Milne-Redhead* 4367 (type); same area, R. Kasompa, in *Brachystegia* woodland, Feb. 1938, *Milne-Redhead* 4367A.

This species, which is clearly allied to *H. nyasae* Rolfe and *H. papillosa* Summerh., is characterised by the minutely papillose petals and labellum, which have otherwise only a few short cilia on the margins, and the relatively short labellum-limb which is about the same length as the spur. The sepals are longly ciliate as in *H. nyasae* but there are only 5–7 lobes on the labellum. The secund flower spikes are very narrow as the flowers do not spread much.

Holothrix nyasae *Rolfe* in Dyer, Fl. Trop. Afr. **7**, 193 (1898)

H. nyasae var. *blepharodactyla* Schltr. in Engl., Bot. Jahrb. **53**, 487 (1915)

In the course of his account of the orchids collected in southern Tanganyika by A. Stolz, Schlechter described the above mentioned variety, distinguishing it from what he believed to be the type on account of the long ciliate petals and labellum. He was no doubt basing this view on Rolfe's account of *H. nyasae* in which, although these organs are not specifically said to be glabrous, no mention is made of any cilia or hairs on them. An examination of Rolfe's type in the Kew Herbarium shows without doubt, however, that the petals and labellum are long ciliate, especially on the finger-like lobes, these cilia being quite as frequent as in *Stolz* 2527, the type of Schlechter's var. *blepharodactyla*. In other respects also the two gatherings are in close agreement.

It should be pointed out that the labellum in several flowers on Rolfe's type has 9 lobes altogether though one or two may be much shorter than the others. Rolfe states that this organ is 7-lobed and this may be true of some flowers though I have seen none such on his type specimen. In other plants of this species the labellum may be as much as 13-lobed while I have also seen 7-lobed labella in yet other cases, so it is clear that the number varies within comparatively wide limits.

The plant which Schlechter thought was the true *H. nyasae* (*Stolz* 2608) is described elsewhere in this paper as a new species, *H. papillosa* Summerh.

Holothrix papillosa *Summerh.*, sp. nov.; affinis *H. nyasae* Rolfe, a qua floribus minoribus, petalis labelloque dimidio apicali dense et distincte papillosis nec ciliatis, labello 5–7-lobato tantum satis differt.

Herba terrestris, 9–30 cm. alta; tubera ellipsoidea vel globosa, 6–10 mm. longa, 5–7 mm. diametro, ± dense tomentosa. *Caulis* brevissimus, 2-foliatus, basi cataphyllis paucis instructus. *Folia* humistrata, sessilia, carnosa, supra longiuscule pilosa, subtus glabra; inferius majus, reniforme vel reniformi-

orbiculare, apice apiculatum, basi ± cordatum, 1–2 cm. longum, 1·5–3 cm. latum; superius minus, late ovatum vel fere orbiculare, apice acutum, 1–1·8 cm. longum, 8–16 mm. latum. *Scapus* erectus, gracilis, evaginatus, 9–30 cm. altus, 1–2 mm. diametro, teres, pilis tenuibus patentibus instructus. *Racemus* laxiuscule multi- vel pluriflorus, 2–8 cm. longus, circiter 1 cm. diametro; bracteae lanceolatae, acuminatae, ovarium pedicellatum ± aequantes, dense pilosae et ciliatae. *Flores* secundi, breviter pedicellati, arcuatim patentes, pro maxima parte albi; ovarium pedicellatum circiter 3 mm. longum, ellipsoideum, dense pilosum. *Sepalum* intermedium ovato-oblongum vel anguste ovatum, apice acutum vel fere apiculatum, 1·7–3 mm. longum, 1·25–1·8 mm. latum, uninervium; sepala lateralia valde oblique ovata, apice breviter acuminata, 1·7–2·8 mm. longa, 1·4–1·7 mm. lata, uni- vel binervia; omnia sepala longe ciliata. *Petala* ambitu cuneata, triente apicali trilobata, 4·2–5·3 mm. longa, trinervia, lobis lineari-ligulatis apice rotundatis (dactylis similibus) 1–2 mm. longis dense et distincte papillosis. *Labellum* e basi columnae adnatum, ± flabellatum vel late cuneatum, dimidio vel triente apicali 5–7-lobatum, 4·5–5·5 mm. longum, explanatum 2–4-mm. latum; lobi lineari-ligulati, apice rotundati, usque 1·8 mm. longi, dense et distincte papillosi; calcar leviter incurvatum vel rectum, ex ore lato anguste conicum, 2–2·25 mm. longum. *Anthera* leviter recurvata, circiter 1 mm. alta, loculis parallelis.

Tanganyika Territory. Ufipa Distr., Kwela to Kasvala, 1680–1800 m. alt., wet banks in shade in *Brachystegia–Julbernardia* woodland, March 1950, *Bullock* 2708; Mmemya Mt., 2200 m. alt., in rock crevices at summit, Feb. 1951, *Bullock* 3713; Ukinga Mts., Mwennitela, 2000 m. alt., in mountain meadow, March 1914, *Stolz* 2608 (type).

Nyasaland. Karonga Distr., Mussissi Mt., 1950 m. alt., in short grassy downland among boulders, in gravelly soil, May 1947, *Benson* 1250.

This species, which appears to occur at rather high altitudes on a number of mountains in southern Tanganyika and northern Nyasaland, is evidently allied to *H. nyasae* Rolfe. In fact the type gathering (*Stolz* 2608) was referred to *H. nyasae* by Schlechter (in Engl., Bot. Jahrb. **53**, 487: 1915) under the mistaken impression that in Rolfe's species the petals and labellum are glabrous. As a matter of fact they are longly ciliate and quite different in appearance from those in *H. papillosa*. The strongly papillose but otherwise glabrous petals and labellum in the latter species are very evident under a hand-lens. The species differs also from *H. nyasae* in the other characters given in the diagnosis.

Holothrix pentadactyla (*Summerh.*) *Summerh.*, comb. nov.

Deroemera pentadactyla Summerh. in Kew Bull. **1927**, 418

Characterised by the short dense secund inflorescence, the shortly 5-lobed petals and 5–7-lobed labellum. The plant is glabrous except for the base of the scape which is retrorsely hairy. So far the species has been found only in Kenya.

Holothrix randii Rendle in Journ. Bot. Lond. **37**, 208 (1899)

H. reckii Bolus, Ic. Orch. Austr.-Afr. **3**, t. 21 (1913)

Examination of the type specimens or type gatherings of the above two concepts shows that they are conspecific. The species differs from *H. longiflora* Rolfe in the glabrous scape, bracts, ovary and sepals, in the slightly smaller flowers and in the much longer markedly incurved spur. I have seen specimens of the species from Tanganyika, Southern Rhodesia, the Transvaal and Cape Province but it has not yet been recorded from Nyasaland.

Schwartzkopffia lastii (*Rolfe*) *Schltr.*, Die Orchid. 63 (1914)

Brachycorythis lastii Rolfe in Dyer, Fl. Trop. Afr. **7**, 203 (1898)

Schwartzkopffia angolensis Schltr. in Beih. Bot. Centralbl. **38**, ii, 123 (1921

On examination of the type specimen of *S. lastii*, a tracing of Schlechter's drawings of the type specimen of *S. angolensis* (the type itself has been destroyed) and nearly 20 other gatherings, I find myself unable to distinguish two species and am therefore uniting the two concepts under the earlier epithet *lastii*. Schlechter, who had apparently seen only one gathering of each of the concepts he recognised, separated *S. angolensis* from *S. lastii* on account of the shape of the middle lobe of the labellum, the larger rounded hypochile, the epichile more narrowed at the base and the more oblong lateral sepals.

When a large number of gatherings are examined none of these characters is found to be of value in distinguishing separate concepts nor does there seem to be any correlation between them. The shape of the middle labellum lobe and its length in relation to the lateral lobes varies widely as also do all the other characters mentioned. There is also considerable variation in the size of the flowers and in the shape of the angular sides of the labellum hypochile, which I thought at one time might be significant. In spite of these variations the general facies is very constant. *S. pumilio* (Lindl.) Schltr., which is restricted to West Africa, can be recognised by the much broader labellum with three almost equal lobes. I have now seen gatherings of *S. lastii* from southern Tanganyika Territory, the Belgian Congo, Angola, Northern and Southern Rhodesia, Nyasaland and Mozambique.

Schizochilus lepidus *Summerh.*, sp. nov.; a *S. rudatisii* Schltr. statura minore, foliis prope caulis basin + aggregatis, racemo longiore et densifloro, sepalis trinervibus tantum, callis inter se aequaliter evolutis satis differt.

Herba terrestris, erecta, omnino glabra, usque 25 cm. alta; tubera non visa. *Caulis* leviter flexuosus vel fere rectus, basi foliatus, superne vaginis foliatis numerosis lanceolatis acuminatis instructus, apice in inflorescentiam terminans. *Folia* 1–2 infima vaginiformia, intermedia 3–4 fere basalia adscendentia, lanceolata vel elliptico-lanceolata, acuta vel breviter acuminata, usque 6 cm. longa et 2 cm. lata, superiora 6–8 in vaginas foliatas redacta. *Inflorescentia* dense multiflora, usque 7 cm. longa, 1–1·5 cm. diametro; bracteae lanceolatae, acuminatae, floribus breviores. *Flores* adscendentes, flavi; pedicellus cum ovario circiter 7 mm. longus. *Sepalum* intermedium leviter incurvatum, convexum, lanceolato-ellipticum, apice subacutum, 6 mm. longum, 3 mm. latum; sepala lateralia oblique late lanceolata, subacuta, 6·5 mm. longa, fere 3 mm. lata; omnia sepala trinervia vel rarius subquadrinervia. *Petala* oblique rhombeo-lanceolata, acuta, fere 4 mm. longa,

2 mm. lata, uni- vel subbinervia, textura diaphana. *Labellum* ambitu lanceolatum, basi cum columna adnatum, dimidio apicali trilobatum, 6·5 mm. longum et 2·5 mm. latum, lobis lateralibus parvis triangularibus 0·4 mm. longis, lobo intermedio multo majore elongate triangulari 2·5 mm. longo 1·5 mm. lato, disco callis tribus aequalibus obtusis instructum; calcar fere rectum, leviter clavatum apice rotundatum, circiter 2 mm. longum. *Columna* leviter recurvata, 2 mm. longa; anthera apice rotundata, loculis parallelis.

Mozambique. Tsitsera Distr., 2250 m. alt., in tussocky rocky ground on summit ridge, March 1954, *Wild* 4471 (*S. R. Gov. Herb.* 46231). 'Also on Southern Rhodesian side of border on same mountain'.

This rather attractive species is mostly closely allied to the Natal species *S. rudatisii* Schltr., from which it differs in the characters mentioned in the diagnosis. Of special interest are the clustered almost basal rather broad leaves and the relatively sudden transition from those to the much smaller bract-like leaves or sheaths which nearly cover the remainder of the stem. The three calli on the lower part of the labellum are almost equal in size and obtuse in front whereas in *S. rudatisii* the lateral ones are not so well developed as the central one which is more keel-like in shape.

Stenoglottis fimbriata *Lindl.* in Hook., Comp. Bot. Mag. **2**, 210 (1837)
S. zambesiaca Rolfe in Dyer, Fl. Trop. Afr. **7**, 190 (1897)

On examination of the type specimens of the above two concepts together with over 30 other gatherings, distributed from Tanganyika in the north to the Cape Province in the south, I am unable to find any differences of specific importance. I am therefore uniting the two concepts under the earlier epithet *fimbriata*. Rolfe gives the shape of the leaves as the main distinction between the two concepts, together with 'various other details' not specified, but comparison of the leaves in all the gatherings seen reveals no differences of any significance. There is a certain amount of variation in the floral structure, particularly as regards the shape and relative lengths of the lobes of the labellum but I have not been able to correlate these variations with one another.

Habenaria (sect. **Pentaceras**) **richardsiae** *Summerh.*, sp. nov.; ab aliis speciebus sectionis, *H. magnirostri* Summerh. excepta, foliis paucis inferioribus majoribus fere basalibus, superioribus minoribus bracteiformibus, ab *H. magnirostri* Summerh. calcari apice rotundato haud retuso vel bilobulato, rostelli lobo intermedio dentiformi inter antherae loculos abscondito, antherae canalibus triplo brevioribus facile distinguenda.

Herba terrestris, erecta, 25–35 cm. alta, fere omnino glabra; tubera ovoidea, 1–1·5 cm. longa, 0·6–1 cm. diametro, ut videtur glabra. *Caulis* fere rectus, teres, basi 2–4 mm. diametro, per totam longitudinem sublaxe foliatus, apice in inflorescentiam terminans. *Folia* 2 infima vaginiformia, ± scariosa; 2–3 inferiora fere basalia, suberecta, lanceolata, acuta, 4·5–5·5 cm. longa, 8–14 mm. lata; superiora sursum decrescentia, bracteiformia, cauli ± adpressa, apice ± acuminata, usque 4·5 cm. longa, superne in bracteas abeuntia. *Racemus* laxe 4–7-florus, 6–9 cm. longus, 3–4 cm. diametro; rhachis propter bractearum bases decurrentes leviter angulata;

bracteae basi vix vaginantes, lanceolatae, acuminatae, 1–2 cm. longae, marginibus ciliolatis, ovario pedicellato valde breviores. *Flores* arcuatim erecto-patentes vel suberecti, de colore nil constat; pedicellus cum ovario 2·5–3·5 cm. longus, ± recurvatim arcuatus. *Sepalum* intermedium erectum, convexum, ellipticum, apice obtusum leviter papillosum, circiter 5 mm. longum et 3 mm. latum; sepala lateralia decurvatim patentia, curvatim obovato-oblonga, apice rotundata, circiter 6·25 mm. longa et 3 mm. lata; omnia sepala trinervia. *Petala* fere ad basin bipartita; partitio postica erecta, cum sepalo intermedio agglutinata, curvatim lanceolato-ligulata, apice acuta, circiter 4·75 mm. longa et 1·25 mm. lata, apice papillosa et papilloso-ciliolata, binervis; partitio antica decurvatim patens, anguste lanceolato-ligulata, partitione postica paulo brevior vel aequilongis, fere 1 mm. lata, ± carnosa, uninervis. *Labellum* fere ad basin tripartitum, 8·5–9 mm. longum; partitio intermedia recta, pendens, ligulata, apice rotundata, fere 8 mm. longa et 1·5 mm. lata, carnosa, lateribus leviter incurvatis; partitiones laterales ex intermedia fere angulo recto divergentes, patentes, leviter falcatim recurvatae, lineares, circiter 7·5 mm longae et 0·7 mm. latae, ± carnosae; calcar dependens, dimidio basali auguste cylindricum, dimidio apicali clavatim inflatum, apice ipso rotundatum, 2·3–3 cm. longum. *Anthera* erecta, 3·5–4 mm. alta, apice breviter apiculata, loculis parallelis, canalibus incurvatis brevibus 0·8 mm. longis, auriculis sessilibus fere bilobulatis. *Stigmata* porrecta, truncatim clavata, circiter 2 mm. longa; rostelli lobus intermedius triangularis, brevis, 0·8 mm. longus, lobi laterales incurvati, truncati, 1·2 mm. longi. *Ovarium* dense papillosum.

Tanganyika Territory. Njombe Distr., Mwakete–Njombe road, 2100 m. alt., in wet swampy ground, Jan. 1957, *Richards* 7860 (type).

This species, like its closest congener *H. magnirostris* Summerh., described herewith, combines in its general features the two sections *Chlorinae* and *Pentaceras*. From the former it may be distinguished by the bipartite petals, but the floral structure and vegetative characters are otherwise very similar to those of species like *H. filicornis* Lindl. From the other species of sect. *Pentaceras*, in which section it is best placed on account of the bipartite petals and clavate not capitate stigmas, it differs in the general leaf-arrangement. In most species of this section the lower part of the stem bears sheaths only, the foliage leaves being borne in the middle part of the stem up to the base of the inflorescence. In *H. richardsiae*, on the other hand, there are two sheaths close together at the base of the stem and immediately above these are the two or three foliage leaves which are thus almost basal in position. The upper part of the stem bears a number of much smaller bract-like leaves or sheaths. The present species differs from *H. magnirostris* by the characters given in the diagnosis. The species is named in honour of the collector, Mrs. H. M. Richards, whose extensive collections in Northern Rhodesia and Tanganyika have much increased our knowledge of the orchid flora of these regions.

Habenaria (sect. **Pentaceras**) **magnirostris** *Summerh.*, sp. nov.; affinis *H. richardsiae* Summerh., a qua calcari apice retuso vel breviter bilobulato, antherae canalibus triplo longioribus, rostelli lobo intermedio multo majore ± cucullato antherae anteposito satis distinguitur.

Herba terrestris, erecta, 20–50 cm. alta, radicibus exceptis glabra; tubera ovoidea vel ellipsoidea, 1–2 cm. longa, 8–13 mm. diametro, sparse tomentoso-pilosa; radices patentes, flexuosae, tenues, laxe pilosae. *Caulis* fere rectus, ut videtur teres, basi 2–5 mm. diametro, per totam longitudinem sublaxe foliatus, apice in inflorescentiam terminans. *Folia* 2–3 infima vaginiformia, cauli ± adpressa, acuminata; 2–3 inferiora suberecta, lanceolato-linearia, anguste lanceolata vel lanceolata, acuta vel breviter acuminata, 3–9 cm. longa, 5–16 mm. lata; superiora sensim decrescentia, suprema bracteiformia. *Racemus* laxe 2–13-florus, 4–15 cm. longus, 3–5 cm, diametro; rhachis leviter angulata; bracteae basi fere vaginantes, lanceolatae. acuminatae, 1–2 cm. longae, ovario pedicellato valde breviores. *Flores* suberecti vel arcuatim subpatentes, virides; pedicellus cum ovario leviter arcuatus, 2–3 cm. longus. *Sepalum* intermedium erectum vel leviter incurvatum, ellipticum vel elliptico-ovatum, apice obtusum fere cucullatum, valde concavum, 5–7·5 mm. longum, 2·5–3·2 mm. latum; sepala lateralia deflexim patentia, curvatim semi-obovata, apice obtusa, 6–8·2 mm. longa, 3–4 mm. lata; omnia sepala trinervia. *Petala* fere ad basin bipartita; partitio postica erecta, cum sepalo intermedio agglutinata galeam convexam formans, lanceolato-ligulata vel anguste lanceolata, acuta, 4·7–7 mm. longa, 1–1·6 mm. lata, apice ciliolata bi- vel subtrinervis; partitio antica decurvatim patens, e basi angustiore ligulata vel anguste lanceolato-ligulata, apice ipso rotundata, postica longior, 5·5–8·2 mm. longa, 0·6–1 mm. lata, carnosa et opaca, dimidio basali uninervis. *Labellum* fere ad basin tripartitum, dependens; unguis latus, circiter 3 mm. longus; partitio intermedia ligulata, convexa, apice rotundata, 8–11·5 mm. longa, 0·9–1·4 mm. lata; partitiones laterales quam intermedia fere aequilongae vel paulo longiores, lineares, 7–14 mm. longae, 0·5–0·75 mm. latae; calcar dependens, leviter incurvatum, dimidio basali anguste cylindricum, dimidio apicali clavatim inflatum, apice ipso truncatum et leviter retusum vel bilobulatum, 19–30 mm. longum, fere 2 mm. diametro. *Anthera* erecta; leviter incurvata, 3·5–4·5 mm. alta, apice breviter apiculata, loculis parallelis, canalibus incurvatis 2·5–3·5 mm. longis, auriculis ovatis vel fere orbicularibus rugulosis; stigmata deorsum porrecta, clavata, apice acuta, parallela, 2·7–3 mm. longa; rostelli lobus intermedius magnus, apice ± cucullatus apiculatus, antherae antepositus, 1·7–3·5 mm. altus, lobi laterales incurvati, apice truncati, quam intermedium duplo breviores, 1–1·5 mm. longi.

Tanganyika Territory. Songea Distr., Ulamboni Valley, 11 km. W. of Songea, 960 m. alt., in boggy grassland, Jan. 1956, *Milne-Redhead & Taylor* 7997 (type).

Northern Rhodesia. Mwinilunga Distr., Sinkabolo Dambo, in very wet and waterlogged boggy grassland, Dec. 1937, *Milne-Redhead* 3568; Kasama, Malima Dambo, 1260 m., in marshy ground, Dec. 1953, *Benson* N.R.56; same locality, in *Brachystegia* woodland, Dec. 1953, *Benson* N.R.55.

Southern Rhodesia. Marandellas Distr., 1500 m. alt., in vlei, Dec. 1948, *Mrs. Glen* (*S.R. Gov. Herb.* 22341); same district, 1440 m. alt., in vlei, Jan. 1952, *Corby* 760 (*S.R. Gov. Herb.* 35974).

This species, like its ally *H. richardsiae* Summerh., though falling technically into sect. *Pentaceras* on account of the flower-structure, is reminiscent vegetatively of *H. filicornis* Lindl. in sect. *Chlorinae*. It is characterised by the

large middle lobe of the rostellum which is placed in front of the anther in much the same way as in some species of *Platycoryne*. The other differences from *H. richardsiae* are mentioned in the diagnosis. The species seems to be distributed widely in the southern part of eastern Africa, but has not yet been found in Nyasaland.

Habenaria (sect. **Ceratopetalae**) **gonatosiphon** *Summerh.*, sp. nov.; ab *H. holubii* Rolfe petalorum partibus anticis pro rata brevioribus, antherae canalibus ut stigmatibus duplo brevioribus, labelli calcari geniculatim curvato satis differt.

Herba terrestris, erecta, 25–75 cm. alta, radicibus exceptis fere omnino glabra; tubera ellipsoidea vel elongato-conica, 2·5–3·5 cm. longa, 9–12 mm. diametro, sparsiuscule tomentoso-pilosa; radices flexuosae, tenues, sparsiuscule pilosae. *Caulis* strictus, per totam longitudinem foliatus, teres vel leviter striatus, in inflorescentiam plurifloram terminans. *Folia* infima vaginiformia, intermedia lanceolata, ovato-lanceolata vel fere ovata, acuta vel acuminata, usque 11 cm. longa et 3·5 cm. lata, superiora sursum decrescentia in bracteas abeuntia. *Racemus* (floribus inclusis) usque 14 cm. longus, usque 9-florus; bracteae foliaceae, lanceolatae vel late lanceolatae, acuminatae, usque 3 cm. longae, ovario pedicellato duplo breviores. *Flores* suberecti, albi, cremeo-albi, cremei vel cremeo-virides; pedicellus cum ovario 4–6 cm. longus. *Sepalum* intermedium erectum, late ellipticum, apice obtusum, valde convexum, 8–11 mm. longum, non explanatum 5·5–6·5 mm. latum; sepala lateralia deflexim patentia, marginibus valde revolutis, oblique semi-orbicularia, apice subacuta, 10·5–13·5 mm. longa, 7–8·5 mm. lata; omnia sepala reticulatim subquinquenervia. *Petala* fere ad basin bipartita; partitio postica erecta, cum sepalo intermedio agglutinata, curvatim linearis vel ligulata, apice subacuta, 8–11 mm. longa, 1–1·8 mm. lata, binervis; partitio antica arcuatim incurvato-patens, linearis, carnosa, 13–16·5 mm. longa, 1·75–2·4 mm. lata, uninervis. *Labellum* ex ungue brevi circiter 2 mm. longo valde tripartitum; partitio intermedia ligulata, apice rotundata, 12–17·5 mm. longa, 1·5–3 mm. lata, subcarnosa, trinervis; partitiones laterales ex intermedia divergentes, e basi angusta anguste lanceolatae, apice acutae, 8·5–12 mm. longae, 1·5–3·2 mm. latae, uninerviae; calcar dependens, triente basali geniculatim recurvatum, triente apicali modice clavato-inflatum, 5·5–6·5 cm. longum. *Anthera* erecta, apice rotundata vel leviter apiculata, 4·5–6 mm. alta, loculis fere parallelis, canalibus porrectis vel leviter incurvatis 2·2–3 mm. longis, auriculis parvis vix evolutis. *Stigmata* porrecta, crassa, apice truncatim capitata, faciei superiore canaliculata, 5·5–6 mm. longa; rostelli lobus intermedius erectus, inter antherae loculos positus, triangularis, acutus, circiter 3·5 mm. longus, lobi laterales ex intermedio angulo fere recto divergentes, apice truncati, 1·7–3 mm. longi.

Tanganyika Territory. Kigoma Distr., Kasulu, 1440 m. alt., in light red clay loam, Jan. 1931, *Rounce* D4; Njombe Distr., Mwakete–Njombe road, 2100 m. alt., Jan. 1957, *Richards* 7853; Songea Distr., Ulamboni valley, 11 km. W. of Songea, 960 m. alt., in boggy grassland, Dec. 1955, *Milne-Redhead & Taylor* 7982 (type); 15 km. E. of Songea, 1050 m. alt., in sandy boggy grassland by stream, Jan. 1956, *Milne-Redhead & Taylor* 8347.

Northern Rhodesia. Abercorn Distr., Nkali Dambo, 1500 m. alt., in rough grass in sun, Jan. 1952, *Richards* 331; Kawimbe, 1680 m. alt., in swamp near fishpond, Dec. 1956, *Richards* 7321.

This attractive species is of especial interest because it combines in certain respects the characters of the two sections *Ceratopetalae* and *Macrurae*. In general appearance the plant is reminiscent of species such as *H. holubii* Rolfe and *H. clavata* Lindl. in sect. *Ceratopetalae*, the anterior petal-lobe, though relatively shorter than in these species, being quite fleshy and considerably longer than the posterior lobe. The stigmata, though capitate as in sect. *Ceratopetalae*, are much shorter and thicker and in this feature resemble those in sect. *Macrurae*. Another respect in which *H. gonatosiphon* approaches this latter section is in the relatively broad labellum-segments, which though not so petaloid as in *H. walleri* Rchb.f., for example, are broader than in most members of sect. *Ceratopetalae*. The species may be recognised from other similar looking species by the curious knee-like bend in the spur, the specific epithet being derived from this character. From the base the spur is strongly incurved in the basal third so that it lies beneath and more or less parallel to the middle lobe of the labellum. Beyond this it is strongly recurved in a knee-like manner the remainder of the spur being nearly straight or slightly curved forward or backwards. The anterior petal-lobes and labellum are white or cream-coloured while the sepals and spur are more or less tinged greenish.

Habenaria sectio **Kryptostoma** *Summerh.*, sect. nov.

Caulis erectus, foliatus; folia ovata vel lanceolata, sursum in bracteas abeuntia; flores mediocres (2–4 cm. diametro); petala infra medium bilobata, glabra, lobo postico cum sepalo intermedio agglutinato, lobo antico quam postico multo longiore anguste lineari vel fere filiformi; labellum basi cum columnae adnatum, ex ungue libera brevi longe tripartitum, lobis lateralibus quam intermedio longioribus, calcari cylindrico apice leviter inflato; anthera humilis, connectivo perlato anguste hippocrepimorphi lateribus fere parallelis cum labelli basi adnatis calcaris orem circumdato loculis horizontalibus; stigmata leviter recurvata, clavata, rostelli lobo intermedio brevissimo vix evoluto.

Species 2 adhuc notae, Africae tropicae indigenae.

Species typica sectionis: *H. tentaculigera* Rchb.f.

The members of this section, namely *H. tentaculigera* Rchb.f. and *H. goetzeana* Kraenzl., are characterised especially by the structure of the column. The anther connective is extended laterally and folded so as to form a sort of compressed horseshoe. The two loculi are borne at the two ends but as a result of the folding of the connective they are quite close to one another. The base of the labellum is fused to this horseshoe, the orifice of the spur being right at the back and completely hidden by the connective-sides; from this feature is derived the sectional name.

The very broad low connective is also found in sect. *Multipartitae* but the species of that section are otherwise quite different, possessing, *inter alia*, undivided petals. The fusion of the base of the labellum and lateral sepals with the column is also found in the genus *Bonatea* but in that genus the

anterior petal-lobe and stigmata are also adnate to the labellum, the rostellum is large and usually cucullate while there is a distinct tooth in the spur orifice. All these features are absent in sect. *Kryptostoma*.

In certain respects the species of the present section resemble those of sect. *Ceratopetalae*, in which section they were placed by Kraenzlin and Schlechter. The column structure is, however, quite different and the floral characters also differ in a number of small but, I think, significant points, such as the lobing of the petals some distance above the base and the clavate not distinctly capitate stigmas.

H. goetzeana can be distinguished easily from *H. tentaculigera* by the more slender habit, the considerably smaller and less heavily built flowers and especially the spur which is bent backwards into an almost complete circle at the base, the major portion sticking up at the back of the flower. In *H. tentaculigera*, on the other hand, the base of the spur is bent forward so as to lie in an almost parallel position immediately below the labellum and anther and then recurved downwards to form a knee-like bend.

Polystachya (sect. **Affines**) **testuana** *Summerh.*, sp. nov.; a *P. camaridioïdi* Summerh. foliis angustioribus, inflorescentiis simplicibus elongatis, floribus paulo majoribus, sepalis minus acuminatis, petalis oblanceolatis, labello angustiore satis differt.

Herba epiphytica, parva, usque 8 cm. alta. *Caules* approximati, usque 2·5 cm. alti, primum tenues, deinde internodio supremo valde dilatato pseudobulbum ellipsoideum vel oblongo-ellipsoideum 5–12 mm. longum apice monophyllum formante, basi radices flexuosas griseas emittentes. *Folia* 3–10, suberecta vel erecto-patentia, basi imbricata; vagina usque 13 mm. longa, longitudinaliter pluricostata; lamina ligulata, lineari-ligulata vel oblanceolato-ligulata, apice rotundata breviter et paulo inaequaliter obtusissime bilobulata, 1–7 cm. longa, 2–9 mm. lata, tenuiter coriacea. *Inflorescentiae* terminales, simplices, 2–5 cm. longae, superne dense 2–6-florae; pedunculus tenuis, 1·5–3 cm. longus, teres, breviter pubescens; bracteae lanceolatae, acuminatae, usque 3 mm. longae, ovario pedicellato breviores. *Flores* non resupinati, erecto-patentes, flavi; pedicellus cum ovario 3–5 mm. longus, subdense pubescens. *Sepalum* intermedium leviter incurvatum, concavum, oblongo-lanceolatum, apice breviter acuminatum, circiter 6 mm. longum et 2·5 mm. latum; sepala lateralia oblique triangulari-ovata, apice breviter acuminata, margine longiore (superiore) 8·5 mm. longa, basi 5 mm. lata, cum pede columnae adnata mentum rotundato-conicum 3·5–4 mm. longum formantia; omnia sepala extra pubescentia, trinervia. *Petala* e basi angusta oblanceolata, apice acuta, 4·8 mm. longa, 1·3 mm. lata, glabra, subtrinervia. *Labellum* ± recurvatum, ex ungue angusto rhombeo-ovatum, medio obscure trilobatum, lobis lateralibus latis rotundatis, lobo intermedio quadrato apice apiculato, totum labellum 5–6 mm. longum, 2·7–4 mm. latum, disco callo humili lineari apice rotundato instructum. *Columna* leviter incurvata, circiter 2 mm. longa, pede incurvato 4 mm. longo. *Anthera* et pollinia non visa.

Gabon. Upper Ngounyé River, Etoughi, E. of Kembélé, Nov. 1925, *Le Testu* 5706 (type in Herb. Le Testu).

This species falls into the small group in sect. *Affines* in which the uppermost or penultimate internode of each stem swells to form the pseudobulb with the result that in the mature stem the pseudobulb is terminated by one, or rarely by two leaves, the remainder of the leaves occurring at its base in a tuft or being spaced out along the almost unthickened lower part of the stem. In the other species of the section the lowest internode (or internodes) of the stem forms the pseudobulb and consequently there are several leaves on the upper part of the stem above the swollen pseudobulb.

The present species is nearest to *P. camaridioïdes* Summerh. from Southern Nigeria but differs by the characters given in the diagnosis.

Polystachya (sect. **Affines**) **bella** *Summerh.*, sp. nov.; affinis *P. obanensi* Rendle, a qua inflorescentiis multifloris, bracteis multo longioribus, floribus majoribus croceis vel vitellinis, labello longiore apice magis acuto lobo intermedio fere omnino carnoso satis differt.

[*P. obanensis* (non Rendle).—Moreau in Journ. East. Afr. Nat. Hist. Soc. **17**, 30 (1943); Jex-Blake, Some Wild Fl. Kenya 139 (1948), 'obenensis'; Piers, East Afr. Orch. 74, fig. 39 (1951)]

Herba epiphytica, 15–20 cm. alta, inflorescentiis exceptis glabra. *Caules* approximati, erecti, basi vaginis paucis vestiti, superne 3–4-foliati, primum cylindrici, deinde internodio ultimo vel penultimo in pseudobulbum ellipsoideo-lenticularem circiter 4 cm. longum et 2 cm. latum sordide viridem apice mono- vel diphyllum incrassato, radices flexuosas griseas emittentes. *Folia* elliptico- vel oblongo-ligulata, apice rotundata paulo inaequaliter breviter bilobulata, basi vix petiolata, 5–16 cm. longa, 1–2·7 cm. lata. *Inflorescentiae* terminales, simplices vel parum ramosae, usque 25 cm. altae, subdense multiflorae; pedunculus basi vagina acuta subscariosa instructus, usque 10 cm. longus, teres vel leviter angulatus, ut rhachis breviter pubescens; rhachis leviter fractiflexa, pluriangulata; bracteae suberectae, lanceolatae, caudato-acuminatae, usque 1·7 cm. longae, pubescentes. *Flores* suberecti, crocei vel vitellini; pedicellus cum ovario leviter arcuatus, circiter 1 cm. longus, dense pubescens. *Sepalum* intermedium leviter incurvatum, lanceolatum vel anguste triangulari-lanceolatum, apice acutum, 12–14 mm. longum, 3–3·5 mm. latum, leviter concavum, 4–6-nervium; sepala lateralia oblique lanceolato-triangularia, apice acuta, margine antico (superiore) 15–17 mm. longa, basi 5–5·5 mm. lata, cum pede columnae adnata mentum latum rotundatum circiter 3·5 mm. longum formantia, 3–4-nervia; omnia sepala extra breviter pubescentia. *Petala* lineari-oblanceolata, apice acuta, 8·5–11 mm. longa, circiter 1·5 mm. lata, subtrinervia. *Labellum* ambitu lanceolatum, medio indistincte trilobatum, 9·5–11·5 mm. longum, explanatum 4·8–5·5 mm. latum; lobi laterales erecti, breviter rotundato-triangulares, apice libera circiter 1 mm. longa; lobus intermedius valde recurvatus, lanceolato-triangularis, acuminatus, 4·5–5 mm. longus, circiter 2·5 mm. latus, valde carnosus; discus basi callo humili lineari instructus. *Columna* leviter incurvata, 2·5–3·5 mm. longa, apice truncata, androclinio leviter excavato; anthera galeatim hemisphaerica, antice truncata.

Kenya Colony. Fort Ternan, 1950 m. alt., on tree over river, Dec. 1927, *Firth*; Kericho, 1800 m. alt., on trees in forest, March 1934, *Jex-Blake in*

Cor. Mus. No. 6342 (type); same locality, Nov. 1929, cult. Changana Tea Estate, *Gray* 2; Kericho Distr., Kiptiget River, Dec. 1941, *Copley* 55; Itare River, Jan. 1940, *Copley in Bally* 409; West Kenya, coll. *Mrs. Copley*, March 1942, cult. and flowered Amani, Jan. 1943, *Moreau* 160.

? Uganda. Said to be from Mt. Elgon, Cult. Entebbe Botanic Gardens, Nov. 1929, *Eggeling* 5871.

This pretty species also belongs to the group in sect. *Affines* in which the uppermost 1 or 2 internodes of each growth later form the pseudobulb. It has been confused with the West African *P. obanensis* Rendle to which it is clearly closely allied. *P. bella* differs in the denser many-flowered inflorescences of golden yellow, not cream-coloured flowers, in the much longer bracts, in the larger flowers in which the tepals are relatively narrower, and in the longer more pointed labellum which is sharply recurved just above the middle. The middle lobe of the labellum is very fleshy and difficult to flatten whereas in *P. obanensis* proper there is only a low central callus in the middle of this lobe.

The species seems to be restricted to a limited area in western Kenya. I have seen no proved Uganda material of this species and should be interested to hear of any records from that country.

Bulbophyllum rugosibulbum *Summerh.*, sp. nov.; affine *B. cochleato* Lindl., a quo statura multo minore, pseudobulbis ovoideis vel ellipsoideis valde rugosis, foliis minoribus, bracteis floribus dimidio brevioribus, floribus rubris facile distinguitur.

Herba ? epiphytica vel saxicola, humilis, rhizomate repente tereti circiter 2 mm. diametro sub pseudobulbis, radices tenues flexuosas emittente. *Pseudobulbi* 5–10 mm. distantes, apice diphylli, aut ovoidei vel ellipsoidei, 1–2 cm. longi, 7–10 mm. diametro, valde rugosi, fusco-rubri, aut (in horto) elongato-conici vel fere fusiformes, obscure angulati, 1·5–2·5 cm. longi, 3–6 mm. lati, laeves, flavido-virides. *Folia* anguste ligulata, apice breviter bilobulata, 3–4 cm. long, 3·5–4·5 mm. lata, pallide viridia. *Inflorescentiae* erectae vel leviter arcuatae, circiter 5 cm. altae; pedunculus gracilis, 3·5 cm. longus, teres, vaginis paucis instructus; rhachis teres, haud incrassata, circiter 11-flora; bracteae lanceolatae, scariosae, circiter 3 mm. longae, floribus breviores. *Flores* distichi, secundi, circiter 2 mm. distantes, rubri; pedicellus cum ovario circiter 2 mm. longus, glaber. *Sepalum* intermedium erectum, lanceolatum, acutum, circiter 4·5 mm. longum et 2·25 mm. latum; sepala lateralia valde recurvatim deflexa, oblique triangulari-lanceolata, superne valde recurvata, apice acuta, 4·25 mm. longa, fere 2 mm. lata; omnia sepala trinervia, glabra. *Petala* lineari-oblonga, apice acuta, circiter 1·5 mm. longa, fere 0·5 mm. lata, uninervia, glabra. *Labellum* e basi valde incrassata geniculatim recurvatum, deinde rectum, ligulatum, apice obtusum, circiter 3 mm. longum, superne 0·4 mm. latum, basi glabrum, triente apicali pilis roseis fere 1 mm. longis instructum, fusco-rubrum, medio leviter canaliculatum. *Columna* brevis, crassa, circiter 1 mm. longa, stelidiis porrectis subulatis circiter 1 mm. longis, pede incurvato 1 mm. longo; anthera hemisphaerica; ovarium glabrum.

Northern Rhodesia. Solwezi, coll. *Holmes* 05; cult. and flowered in Royal Botanic Gardens, Kew, 20 Aug. 1959.

This delightful little species evidently belongs to the same group of species as *B. cochleatum* Lindl., *B. bequaertii* De Wild., and *B. vulcanicum* Kraenzl. but differs from them all in the relatively inconspicuous scarious bracts and the short strongly rugose pseudobulbs. It is a much smaller plant than any of its allies, the inflorescence, which overtops the leaves, reaching a length of only 5 cm.

The type plant showed a striking change in the pseudobulbs after being collected and cultivated prior to sending home. In the wild state the pseudobulbs are reddish in colour, ovoid or ellipsoid in general shape and covered with a series of warts or rounded projections. After collection and while in cultivation the plant developed pseudobulbs of quite a different character, these being relatively long and narrow, quite smooth and of a pale green colour. It will be of interest to see if the plant continues to produce such pseudobulbs or if it will revert to the wild type when it has become acclimatised.

Eulophia laurentii (*De Wild.*) *Summerh.*, comb. nov.

Lissochilus laurentii De Wild. in Bull. Jard. Bot. Brux. **6**, 94, t. XIV, fig. 1–5 (1919)

This species, of which I have now seen excellent material in liquid preservative collected by Dr. R. Germain, seems to be distinct from other species of the *E. horsfallii* group on account of the very narrow leaves, the smaller bracts, the not markedly reflexed sepals, and the three low keels on the labellum which terminate just above the base of the not very well defined middle lobe.

Diaphananthe Schltr. and *Rhipidoglossum* Schltr.

As I have mentioned on two previous occasions (Blumea, Suppl. **1**, 78–79: 1937 and Bot. Mus. Leafl. Harv. Univ. **12**, 96, 97, 109: 1945), these two genera are very closely allied, the column structure in the latter genus being almost identical with that of about half the species of *Diaphananthe*, while in other respects the two genera show strong resemblances. Schlechter's differential character of the presence or absence of a foot to the column has proved of little value but the presence of a tooth-like callus in the mouth of the spur seemed to distinguish *Diaphananthe* satisfactorily from its ally. However in *D. dorothaeae* (Rendle) Summerh. (see Kew Bull. **4**, 441: 1949) we have a plant which lacks that tooth but fits otherwise well into *Diaphananthe*.

The species described for the first time below, namely *D. cuneata*, is an example of the opposite state of affairs. Here the general structure of the flowers closely resembles that in *Rhipidoglossum*, except for the shape of the labellum which is intermediate, but the labellum has a distinct callus in the spur mouth. Other species also show intermediate characters.

A general survey of all the species in the two genera has led me to the conclusion that they cannot be kept separate but must be united under the earlier name *Diaphananthe*. It is not possible to divide the species into groups of more than sectional status on the basis of the column structure as described in my revision (Bot. Mus. Leafl. Harv. Univ. **12**, 97: 1945)

since the general perianth-structure otherwise is often so similar in the two groups and otherwise clearly allied species would be placed in separate genera.

A modified synopsis of the species therefore follows, adding those species described since my previous account was published and including also the various species formerly placed in *Rhipidoglossum*, the total number now being 42.

Diaphananthe Schltr., Die Orchid. 593 (1914) et in Beih. Bot. Centralbl. **36**, ii, 95 (1918); Summerh. in Bot. Mus. Leafl. Harv. Univ. **12**, 95–97 (1943)

Rhipidoglossum Schltr. in Beih. Bot. Centralbl. **36**, ii, 80 (1918); Summerh. in Blumea, Suppl. **1**, 80 (1936)

Species lectotypica: *D. pellucida* (Lindl.) Schltr.

Conspectus

Sectio 1. **Diaphananthe.** Columna brevis, sursum angustata, androclinio parvo obliquo; pollinii stipites duo, viscidium unum commune; rostellum deflexum, rostratum, viscidio amoto bilobatum, lobis subulatis.

Species typica sectionis: *D. pellucida* (Lindl.) Schltr.

(a) Stems very short with a rosette of leaves or only slightly elongated; flowers alternate.

1. **D. pellucida** (*Lindl.*) *Schltr.*
2. **D. cerifera** *J. B. Petersen*
3. **D. dorothaeae** (*Rendle*) *Summerh.*
4. **D. bueae** (*Schltr.*) *Schltr.*
5. **D. plehniana** (*Schltr.*) *Schltr.*
6. **D. suborbicularis** *Summerh.*
7. **D. quintasii** (*Rolfe*) *Schltr.*
8. **D. rohrii** (*Rchb. f.*) *Summerh.*, comb. nov.

   Angraecum rohrii Rchb.f., Otia Bot. Hamburg. 117 (1881)
   Angorchis rohrii (Rchb.f.) Kuntze, Rev. Gen. Pl. 651 (1891)

   This species is clearly allied to *D. quintasii* (Rolfe) Schltr. in general floral structure but it lacks the tooth at the mouth of the spur. The presence of the tooth, however, I do not now consider to be an essential character of the genus.

(b) Stems elongated, leafy along a great deal of their length; flowers alternate.

9. **D. bidens** (*Sw.*) *Schltr.*
10. **D. subclavata** (*Rolfe*) *Schltr.*
11. **D. acuta** (*Ridl.*) *Schltr.*
12. **D. papagayi** (*Rchb. f.*) *Schltr.*
13. **D. congolensis** (*De Wild.*) *Summerh.*
14. **D. divitiflora** (*Kraenzl.*) *Schltr.*
15. **D. lorifolia** *Summerh.*

(c) Stems long or short; flowers opposite or verticillate.

16. **D. fragrantissima** (*Rchb. f.*) *Schltr.*

17. **D. welwitschii** (*Rchb. f.*) *Schltr.*

18. **D. vandiformis** (*Kraenzl.*) *Schltr.*

Sectio 2. **Rhipidoglossum** (*Schltr.*) *Summerh.*, sect. nov. Columna brevis, truncata, androclinio magno; pollinii stipites 2, viscidia 2 distincta; rostellum porrectum, viscidiis amotis trilobatum, lobo intermedio carnoso ± spathulato, lobis lateralibus brevioribus triangularibus.

Species typica sectionis: *D. xanthopollinia* (Rchb.f.) Summerh.

(a) Stems short or only slightly elongated.

19. **D. kamerunensis** (*Schltr.*) *Schltr.*

20. **D. curvata** (*Rolfe*) *Summerh.*

21. **D. polydactyla** (*Kraenzl.*) *Summerh.*

22. **D. mildbraedii** (*Kraenzl.*) *Schltr.*

23. **D. tenerrima** (*Kraenzl.*) *Summerh.*

24. **D. burttii** *Summerh.*

25. **D. pulchella** *Summerh.*

26. **D. ugandensis** (*Rendle*) *Summerh.*

27. **D. laxiflora** (*Summerh.*) *Summerh.*, comb. nov.

Rhipidoglossum laxiflorum Summerh. in Kew Bull. **1936**, 225 (1936)

28. **D. cuneata** Summerh., sp. nov.; a *D. pulchella* Summerh. floribus minoribus, labello cuneato-quadrato, calcari pro rata graciliore, a *D. subsimplici* Summerh. foliis pro rata longioribus, floribus paulo majoribus, calcari longiore, ab utraque petalis fere orbicularibus apice rotundatis vel obtusissimis, a *D. xanthopollinia* (Rchb.f.) Summerh. cauli minus elongato, labello cuneato-quadrato basi calloso et calcari longiore gracilioreque satis distinguenda.

Herba epiphytica, omnino glabra. *Caulis* modice elongatus, circiter 6 cm. longus, per totam longitudinem foliatus, teres vel leviter compressus, circiter 4 mm. diametro, radices flexuosas griseas vel viridi-griseas graciles emittens. *Folia* disticha, patentia, lineari-ligulata, apice inaequaliter et subacute bilobulata lobulo longiore usque 5 mm. longo, in toto 4·5–8·5 cm. longa, 7–11 mm. lata, supra leviter canaliculata, nervo subtus prominulo, saturate viridia, subtus pallidiora. *Inflorescentiae* ex axillis foliorum exortae, ut videtur singulae, graciles, usque 7·5 cm. longae, fere ad basin sublaxe pluri- vel multiflorae, basi vaginis paucis circumdatae; rhachis leviter fractiflexa, teres; bracteae ochreatae, apice obtusae, 2–3 mm. longae. *Flores* patentes, pallide salmoneo-virides vel viridi-salmonei; pedicellus cum rhachide per 2–3 mm. adnatus, parte libera cum ovario circiter 4 mm. longa. *Sepalum* intermedium late ellipticum vel elliptico-orbiculare, apice rotundatum vel obtusissimum, circiter 3 mm. longum, 2·5–3·5 mm. latum, leviter recurvatum,

trinervium; sepala lateralia deflexim patentia, elliptica vel lanceolato-elliptica, apice acuta vel obtusa, circiter 4–5 mm. longa, 2–2·5 mm. lata, binervia. *Petala* late ovato-orbicularia vel late orbicularia, apice obtusissima, 3–3·5 mm. longa et lata, trinervia. *Labellum* leviter recurvatum, convexum, cuneato-quadratum, apice ± truncatum ± dentatum medio excisum, lateribus ± recurvatis, 5–6 mm. longum, prope apicem 5–6 mm. latum, basi ante ostium calcaris callo humili lunato instructum; calcar cylindricum, gracile, dimidio apicali incurvatum, circiter 1 cm. longum, haud clavato-inflatum. *Columna* horizontalis, crassiuscula, apice dilatata, androclinio leviter declinato leviter excavato; anthera fere hemisphaerica, antice breviter producta truncata, pollinia ellipsoidea 0·5 mm. longa, stipitibus linearibus circiter 1 mm. longis, viscidiis distinctis ellipticis; rostellum porrectum, viscidiis amotis trilobatum, lobo intermedio quam lateralibus multo majore elliptico-spathulato rotundato carnoso, lobis lateralibus dentiformibus, fovea stigmatica transverse oblonga vel elliptica.

Uganda. Bunyoro Distr., Budongo Forest, coll. *J. A. Burgess*; cult. and flowered Royal Botanic Gardens, Kew, Oct. 1959.

This rather charming little species resembles several species and may be distinguished from its closest allies by the characters given in the diagnosis.

29. **D. longicalcar** (*Summerh.*) *Summerh.*, comb. nov.

Rhipidoglossum longicalcar Summerh. in Kew Bull. **1936**, 226 (1936)

(b) Stems much elongated.

30. **D. stolzii** *Schltr.*

31. **D. schimperiana** (*A. Rich.*) *Summerh.*

32. **D. tenuicalcar** *Summerh.*

33. **D. subsimplex** *Summerh.*

34. **D. microphylla** (*Summerh.*) *Summerh.*, comb. nov.

Rhipidoglossum microphyllum Summerh. in Bot. Mus. Leafl. Harv. Univ. **12**, 93 (1945)

35. **D. obanensis** (*Rendle*) *Summerh.*, comb. nov.

Angraecum obanense Rendle in Cat. Talb. Nig. Pl. 104, t. 14, fig. 1–2 (1913)

Rhipidoglossum obanense (Rendle) Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 449 (1936)

36. **D. globuloso-calcarata** (*De Wild.*) *Summerh.*, comb. nov.

Angraecum globuloso-calcaratum De Wild. in Bull. Jard. Bot. Brux. **5**, 186 (1916)

Rhipidoglossum globuloso-calcaratum (De Wild.) Summerh. in Blumea, Suppl. **1**, 82 (1937)

37. **D. brevifolia** (*Summerh.*) *Summerh.*, comb. nov.

Rhipidoglossum brevifolium Summerh. in Blumea, Suppl. **1**, 83 (1937)

38. **D. densiflora** (*Summerh.*) *Summerh.*, comb. nov.

Rhipidoglossum densiflorum Summerh. in Bot. Mus. Leafl. Harv. Univ. **12**, 91 (1945)

39. **D. erecto-calcarata** (*De Wild.*) *Summerh.*, comb. nov.

Angraecum erecto-calcaratum De Wild. in Bull. Jard. Bot. Brux **5**, 186 (1916)

Tridactyle erecto-calcarata (De Wild.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 144 (1918)

Rhipidoglossum erecto-calcaratum (De Wild.) Summerh. in Kew Bull. **3**, 277 (1948)

40. **D. xanthopollinia** (*Rchb. f.*) *Summerh.*, comb. nov.

Aëranthus xanthopollinius Rchb.f. in Flora **48**, 190 (1865)

Rhipidoglossum xanthopollinium (Rchb.f.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 81 (1918); Summerh. in Blumea, Suppl. **1**, 84 (1937)

A more complete synonymy of this species will be found in my revision of *Rhipidoglossum* at the above reference.

41. **D. peglerae** (*Bolus*) *Summerh.*, comb. nov.

Mystacidium peglerae Bolus in Trans. S. Afr. Phil. Soc. **16**, 146 (1905)

Rhipidoglossum peglerae (Bolus) Schltr. in Beih. Bot. Centralbl. **36**, ii, 80 (1918)

42. **D. rutila** (*Rchb.f.*) *Summerh.*, comb. nov.

Aëranthus rutilus Rchb.f. in Flora **68**, 382 (1885)

Rhipidoglossum rutilum (Rchb.f.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 81 (1918); Summerh. in Blumea, Suppl. **1**, 85 (1937)

A more complete synonymy of this species also will be found in my revision of *Rhipidoglossum* (see above reference).

Cyrtorchis Schltr.

The genus *Cyrtorchis* was first proposed by Schlechter in 1914 in his wellknown text-book on the family Orchidaceae (Die Orchideen, 595). It was created to include the group of species allied to *Angraecum arcuatum* Lindl. (*Listrostachys arcuata* (Lindl.) Rchb.f.) and was characterised by the lanceolate recurved sepals and petals, the labellum very similar to these but passing gradually at the base into a long tapering spur, the very short column and long drawn-out rostellum. The two pollinia were attached by long separate stipites to a common viscidium. The above description still portrays clearly the characteristic features of the genus. Schlechter named four species, all previously referred to *Angraecum* or *Listrostachys*, but he stated that the genus contained about 15 species altogether.

Four years later, in his general revision of the Angraecoid orchids (Beih. Bot. Centralbl. **36**, ii, 127–133: 1918), he gave a more complete account of

his genus and enumerated 22 species which he considered to be referable to it. One of these, *C. refracta* (Kraenzl.) Schltr., has since been shown to belong to the genus *Ancistrorhynchus* (Bot. Mus. Leafl. Harv. Univ. **11**, 213: 1944) but, with the exception of *Angraecum wittmackii* Kraenzl., which Schlechter doubtfully included, all the others are correctly referred to *Cyrtorchis*. *A. wittmackii* is almost certainly conspecific with *Tridactyle anthomaniaca* (Rchb.f.) Summerh. (see Kew Bull. **3**, 285: 1948).

Schlechter made no attempt to divide the genus into sections and indeed on examination of the vegetative characters, inflorescences and general structure of the flowers one can find no really satisfactory distinguishing characters. Examination of the viscidium of the pollinarium shows, however, that the species can be arranged in two distinct groups depending on the structure of this organ, as I have previously indicated (Kew Bull. **3**, 278). In one of these, including the type species of the genus, *C. arcuata* (Lindl.) Schltr., the viscidium consists of two distinct parts. The upper part, to which the two stipites are attached, is more or less indurated and opaque with the sides curved underneath, rather as in a saddle; the lower part, on the other hand, is usually narrower, very thin and hyaline. This latter part is attached more or less firmly to the side-lobes of the rostellum and often remains behind with them if the pollinarium is removed too abruptly. It can, however, be detached with the remainder of the pollinarium if care is taken. This section must, of course, bear the name *Cyrtorchis* and not *Heterocolleticon* as given in the above reference. In the other section, which I termed *Homocolleticon*, the narrow viscidium is of an almost uniform texture throughout and more or less hyaline. The two stipites are attached just above the middle of the viscidium and are usually narrower than in sect. *Cyrtorchis*.

The differentiation of species within these two sections is often not very easy, partly because of the great similarity of nearly all the species as regards vegetative features (except the shape of the leaves), the inflorescences and the gross floral structure, and partly because of the considerable variation shown by some at least of the species. For instance, the type species, *C. arcuata*, as understood here, has flowers which vary in size from the largest recorded in the genus down to nearly the smallest known. There is also much variation in the leaves, though these usually vary within reasonably well-defined limits. It is not known to what extent these differences are related to different ecological conditions, but it seems very probable that many of them have a genetic basis.

In *C. arcuata* there is considerable geographical segregation of characters so that the different regional populations of the species are most conveniently treated as sub-species, but I have noticed few signs of this in any of the other species, probably because many of them have comparatively restricted ranges.

There are several species which are still not very well known and further explorations in their native districts are needed to obtain more complete material. In view of the relatively large size of most of the species and the quite conspicuous and usually strongly fragrant flowers, it seems unlikely that any additional species will be discovered, unless they are considerably smaller than the usual run of the species. On the other hand, it is possible

that further study of the known species may necessitate alterations in the classification proposed here.

Cyrtorchis *Schltr.*, Die Orchid. 594 (1914) et in Beih. Bot. Centralbl. **36**, ii, 127 (1918); Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 457 (1936) et in Kew Bull. **3**, 278 (1948)

Epiphytic herbs, sometimes saxicolous. *Stems* elongated, sometimes much branched, covered below with the sheaths of the fallen leaves, closely leafy at the apex, giving off aerial roots at intervals. *Leaves* distichous, often imbricate, generally spreading or recurved, oblong, ligulate or linear, usually fleshy or leathery and sometimes very thick, often V-shaped in section. *Inflorescences* arising from the axils of the leaves or fallen-off leaves, usually solitary, spreading or more or less recurved, simply racemose, few- to many-flowered. *Flowers* alternate, rather large, white or cream-coloured, often turning yellow or orange with age, the spur sometimes greenish, usually very fragrant; bracts relatively large and conspicuous, brownish. *Sepals* and petals free, lanceolate, very acute, the lateral sepals and petals oblique, all usually strongly recurved. *Labellum* similar to the petals but with a rather broader base, markedly recurved, passing gradually at the base into a long tapering spur. *Column* short and thick, without a foot; androclinium only slightly excavated, and gently sloping towards the front; anther cucullate, usually drawn out into a distinct beak in front; pollinia 2, globose or ellipsoid, each attached to a more or less spathulate stipes which is narrowed at the base; viscidium one, oblong or ligulate, either uniform in structure and thin in texture, or with an indurated saddle-shaped upper part and a very thin hyaline lower part; rostellum long, beak-like, projecting forwards, bifid on removal of the pollinarium, usually with a short central tooth; stigmatic cavity transversely oblong or nearly orbicular.

Lectotype species: *C. arcuata* (Lindl.) Schltr.

Section 1. **Cyrtorchis.** Viscidium consisting of an upper indurated saddle-shaped portion and a lower thin hyaline portion. Lateral lobes of rostellum widened just above the very narrow base. Stipites often much widened in the apical half.—*Heterocollecticon* Summerh. on Kew Bull. **3**, 278 (1948).

Type species of Section: *C. arcuata* (Lindl.) Schltr.

Section 2. **Homocolleticon** Summerh. in Kew Bull. **3**, 278 (1948). Viscidium almost uniform in texture, thin and more or less hyaline. Lateral lobes of rostellum almost parallel-sided in basal part, not at all widened. Stipites usually only moderately widened in the apical half.

Type species of Section: *C. monteiroae* (Rchb.f.) Schltr.

Conspectus of species

Sect. *Cyrtorchis*

1. *C. chailluana* (Hook.f.) Schltr.
2. *C. arcuata* (Lindl.) Schltr.
3. *C. neglecta* Summerh.

4. *C. hamata* (Rolfe) Schltr.
5. *C. acuminata* (Rolfe) Schltr.
6. *C. seretii* (De Wild.) Schltr.
7. *C. erythraeae* (Rolfe) Schltr.
8. *C. aschersonii* (Kraenzl.) Schltr.

Sect. *Homocolleticon* Summerh.

9. *C. monteiroae* (Rchb.f.) Schltr.
10. *C. injoloensis* (De Wild.) Schltr.
11. *C. ringens* (Rchb.f.) Summerh.
12. *C. brownii* (Rolfe) Schltr.
13. *C. praetermissa* Summerh.
14. *C. henriquesiana* (Ridl.) Schltr.
15. *C. crassifolia* Schltr.

Enumeration of species

(Only references to the original places of publication and to standard Floras and revisions are given here).

Sect. *Cyrtorchis*

1. **C. chailluana** (*Hook. f.*) *Schltr.* Die Orchid., 596 (1914) & in Beih. Bot. Centralbl. **36**, ii, 130 (1918); Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 460, fig. 340 (1936): Robyns & Tournay, Fl. Sperm. Parc Nat. Alb. **3**, 519 (1955)

Angraecum chailluanum Hook.f. in Curtis, Bot. Mag. **92**, t. 5589 (1866)
Listrostachys chailluana (Hook.f.) Rchb. f. in Flora, **68**, 381 (1885); Rolfe in Dyer, Fl. Trop. Afr. **7**, 153 (1897)
Angorchis chailluana (Hook.f.) Kuntze, Rev. Gen. Pl. 651 (1891)

Distrib.: S. Nigeria, British and French Cameroons, Gabon, French and Belgian Congo, Uganda

C. chailluana is widely spread in the extensive rain-forests centered on the Congo Basin. It may be readily distinguished by the very long slender spur, 9–16 cm. in length, and large flowers in which the sepals are 3·5–5 cm. long. An interesting feature in which the species differs from *C. arcuata* (Lindl.) Schltr. lies in the relative lengths of the two parts of the viscidium. In the present species the indurated upper portion, which is over 3 mm. in length, is usually distinctly longer than the hyaline portion, whereas in most forms of *C. arcuata* the reverse is the case, the indurated part also being less than 2·5 mm. in length.

2. **C. arcuata** (*Lindl.*) *Schltr.*, Die Orchid. 596 (1914) & in Beih. Bot. Centralbl. **36,** ii, 129 (1918)

Angraecum arcuatum Lindl. in Hook., Comp. Bot. Mag. **2,** 204 (1837)
Listrostachys arcuata (Lindl.) Rchb.f. in Walp., Ann. **6**, 907 (1864); Bolus, Ic. Orch. Austr.-Afr. **2**, t.1 (1911); Rolfe in Dyer, Fl. Cap. **5**, iii, 74 (1912)
Angorchis arcuata (Lindl.) Kuntze, Rev. Gen. Pl. 651 (1891)

C. arcuata is much the most widely spread species of *Cyrtorchis* extending from Sierra Leone in the west eastwards to Kenya Colony and then southwards through East Africa (with a significant gap in Southern Rhodesia) to Natal and the Cape Province of South Africa. Although it is extremely variable in many respects, particularly in the size of the flowers, there is a general resemblance between all the forms, depending on the rather broad fleshy leaves, the very prominent bracts on the inflorescence, the variously curved spur which tapers usually more or less evenly from the base to the apex, the long-beaked anther and the detailed structure of the pollinarium. In the present species the stipites are usually much widened in the apical half while the hyaline part of the viscidium is usually distinctly longer than the upper indurated part; the latter is much shorter than in *C. chailluana* (Hook.f.) Schltr., rarely exceeding 2 mm. in length.

Over the wide distributional range outlined above the species shows marked local segregation, though it is sometimes not easy to draw clear-cut lines between these local groupings. It seems best to treat the more obvious of these as sub-species though it must be recognised that there are minor distinct segregations within some of them which, however, are scarcely worthy of separate treatment. Five main sub-species can be recognised but it is possible that further work in the field may make it necessary to modify the groups put forward here. Several of these sub-species have been described previously as distinct species but the differential characters given by their authors can be seen on the examination of plentiful material to be of little taxonomic value.

subsp. **whytei** (*Rolfe*) *Summerh.*, stat. nov., a subspeciei typica foliis latioribus, floribus majoribus, calcari satis longiore differt.

Listrostachys whytei Rolfe in Dyer, Fl. Trop. Afr. **7**, 155 (1897)
Angraecum whytei (Rolfe) De Wild. in Bull. Jard. Bot. Brux. **5**, 191 (1916)
Cyrtorchis whytei (Rolfe) Schltr. in Beih. Bot. Centralbl. **36**, ii, 133 (1918)

Type specimen: Nyasaland, Mlanji Plateau, *Whyte* 102

Distrib.: Sierra Leone, Liberia, Ghana; southern Tanganyika Territory, Nyasaland

As will be seen from the above distribution this subspecies is found in two disjunct areas, one in the extreme west of Africa and the other halfway down the eastern side of the continent. Subsp. *whytei* is characterised by the large flowers and long spurs and in these respects approaches *C. chailluana* (Hook.f.) Schltr. The spur is, however, not so slender, apart from being shorter, while the characters of the viscidium are those of *C. arcuata* taken as a whole. In no place do the two species occur together, so far as I am aware, *C. arcuata* being mainly a savannah plant in tropical Africa. In West Africa subsp. *whytei* might appear to replace *C. chailluana* in parts of Sierra Leone, in Liberia and in Ghana, but from the evidence available it seems to occur in fringing forest and savannah and has not been recorded from true rain-forest. The eastern centre of distribution of subsp. *whytei* on the other hand, is a long way from the nearest recorded stations for *C. chailluana*. A single gathering from Pangani District in north-eastern Tanganyika Territory (*Moreau* 85, partly) agrees well with other gatherings of the subspecies, but is rather isolated from the main centres of distribution.

subsp. **arcuata**

Type specimen: Cape Province, Albany, *Drège* 4580C

Distrib.: Cape Province, Natal, Transvaal, Mozambique

The type subspecies of *C. arcuata* is separated by a gap of about 900 miles (so far as present records show) from the nearest subspecies (subsp. *whytei*) in Nyasaland. Since the intervening areas have been actively explored botanically during the past 20 years it seems likely that the species, if not entirely absent, is very rare in this extensive gap. Although subsp. *whytei* is the nearest geographically, subsp. *variabilis* is much more closely allied to the typical subspecies. Indeed it is difficult to separate the two but the latter has on the whole smaller and narrower leaves and smaller flowers. The beak of the anther is not usually so long as in subsp. *variabilis*. The typical subspecies is remarkably constant, except that the leaves tend to be somewhat larger in the east than in the west, and presumably consists of a relatively stable and limited series of genotypes.

subsp. **variabilis** *Summerh.*, subsp. nov.; a subspeciei typica foliis longioribus et latioribus, floribus majoribus, calcari saepissime satis longiore differt.

Listrostachys sedenii Rchb.f. in Gard. Chron., ser. 2, **9**, 128 (1878); Rolfe in Dyer, Fl. Trop. Afr. **7**, 154 (1897)

Angraecum sedenii (Rchb.f.) Hort. ex Nichols., Dict. Gard. **1**, 79 (1884)

Angorchis sedenii (Rchb.f.) Kuntze, Rev. Gen. Pl. 652 (1891)

Cyrtorchis bracteata Schltr. in Engl., Bot. Jahrb. **53**, 600 (1915)

C. sedenii (Rchb.f.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 132 (1912); Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 461 (1936); Robyns & Tournay, Fl. Sperm. Parc Nat. Alb. **3**, 520 (1955)

Type specimen: Tanganyika, Tanga Distr., Kiwanda, near Muheza, *Moreau* 20

Distrib.: Liberia eastwards to Kenya and southwards in East Africa to Northern Rhodesia and northern Nyasaland

This subspecies is by far the most widely spread and also the most variable, as might be expected. The variability consists in the length and breadth of the leaves, the size of the bracts and the size of the flowers (lateral sepals 1·5–4 cm. long). These latter, however, show a marked degree of uniformity of structure, particularly as regards the column, anther and pollinarium, in which respects they agree well with those of the other subspecies of *C. arcuata*. The spur varies in length between about 3 and 6 cm. and never reaches the lengths occurring in subsp. *whytei*.

I have adopted the epithet *variabilis* for this subspecies rather than those of either of the two former species now included in it (*sedenii* and *bracteata*) partly because the epithet is more suitable, but more so because no type specimen of *C. sedenii* can be found while the type of *C. bracteata* was destroyed with the Berlin Herbarium. The isotype of the latter in the Kew Herbarium is rather incomplete and not satisfactory for nominating as a neotype specimen.

Although I have not seen the type-specimen of *Listrostachys sedenii* Rchb.f., which could not be found at Vienna, I have little doubt that it is referable to the present subspecies. Reichenbach mentions a number of ways in which it

differs from *Angraecum arcuatum* Lindl., the typical subspecies, but several of the points he stresses have no significance since the corresponding characters attributed to *A. arcuatum* are imaginary. One point he mentions is the straight spur, that of the South African species being 'bent'. Most of the plants of subsp. *variabilis* from Zanzibar and Pemba show this feature clearly but it may also be seen in other gatherings scattered all over the range of the subspecies. It can scarcely be considered a character even of sub-specific value. At a later date Reichenbach himself appears to have agreed with this view, since the specimen of *Hildebrandt* 2049 in the Vienna Herbarium, identified by him as *L. sedenii*, has a distinctly curved spur. It seems extremely likely that Seden's original plant came from the Zanzibar region, either from one of the islands or from the mainland nearby, since as early as 1878 very few collectors or other interested persons had penetrated any distance into the interior.

Within subsp. *variabilis* itself there are a number of recognisable local facies which, however, are scarcely worthy of formal discrimination. For instance, all gatherings which I have seen from Ubangi-Shari have small flowers with markedly incurved spurs; the plants around Mt. Elgon, on the borders of Uganda and Kenya, have large flowers with long slightly incurved spurs; on the coast of Kenya the flowers are small and the spurs more or less S-shaped; as already mentioned in the Zanzibar region the rather large flowers have straight spurs; in Northern Rhodesia forms with small fleshy leaves predominate. One could go on mentioning such local segregations and the whole suggests that the group is rather unstable and that further subspecies may still be in the process of development. Satisfactory segregation appears so far to have occurred only at the limits of the total range of the species, where the other subspecies recognised here are found.

subsp. **leonensis** *Summerh.*, subsp. nov.; a subspeciei *variabili* Summerh. floribus paulo minoribus, calcari pro rata longiore, anthera antice denticulata, pollinii stipitibus superne anguste spathulatis, viscidii parte hyalina quam parte indurata duplo longiore differt.

Type specimen: Sierra Leone, Mateboi, Sanda Tenraran Chiefdom, *Adames* 229

Distrib.: Sierra Leone

This subspecies, together with subsp. *whytei*, which is very different in floral characters, replaces subsp. *variabilis* in Sierra Leone. The differences from that subspecies are shown in the diagnosis. Subsp. *leonensis* is characteristic of the orchard-bush country of the northern parts of Sierra Leone. It is interesting to note that in the structure of the anther and pollinarium the subspecies approaches *C. aschersonii* (Kraenzl.) Schltr. The beak of the anther is, however, considerably longer while the indurated part of the viscidium is also longer and narrower. Macroscopically *C. aschersonii* can be distinguished easily by the longer and much narrower leaves.

3. **C. neglecta** *Summerh.*, sp. nov.; affinis *C. arcuatae* (Lindl.) Schltr., a qua foliis angustioribus minus carnosis, floribus minoribus, calcari pro rata longiore, pollinii stipitibus superne anguste spathulatis tantum, viscidii parte hyalina quam parte indurata plus duplo longiore satis differt.

Herba epiphytica, omnino glaberrima; caulis elongatus, interdum ramosus, usque 40 cm. longus vel ultra, 5–10 mm. diametro, inferne vaginis foliorum delapsorum praeditus, apice dense foliatus, per totam longitudinem radices ± flexuosas ramosas griseas emittens. *Folia* disticha, erecto-patentia vel patentia, basi ± imbricata; vagina 1–2 cm. longa, longitudinaliter multi-costulata, leviter compressa; lamina ligulata, basi et apice leviter angustata, apice inaequaliter rotundate bilobulata, 7–23 cm. longa, 8–30 mm. lata, tenuiter coriacea, costa inferne prominente. *Inflorescentiae* ex axillis foliorum exorientes, singulae, simpliciter racemosae, foliis breviores, usque 12 cm. longae, sub-dense 4–12-florae; pedunculus brevis, vaginis paucis latissimis bracteiformibus instructus; rhachis leviter fractiflexa, teres vel leviter angulata; bracteae e basi breviter vaginanti late ovatae vel fere orbiculares, conduplicatae, dorso carinatae, usque 1·5 cm. longae et latae, papyraceae, plurinervosae. *Flores* distichi, ± patentes, juventute albi deinde cremei, calcari interdum salmoneo ochraceo vel viridi, fragrantes; pedicellus cum ovario leviter arcuatus, 1·5–3·5 cm. longus. *Sepalum* intermedium lanceolatum vel late lanceolatum, apice ± acuminatum, 12–25 mm. longum, 4–8 mm. latum; sepala lateralia oblique vel curvatim anguste lanceolata, apice acuminata, 14–27 mm. longa, 3–7 mm. lata; omnia sepala saepissime quinquenervia. *Petala* oblique lanceolata, acuminata, 10–20 mm. longa, 3·3–5·8 mm. lata, tri- vel subquinquenervia; omnia tepala valde recurvata. *Labellum* e basi lata lanceolatum, acuminatum, valde recurvatum, 12–18 mm. longum, basi 4–7 mm. latum; calcar ex ore lato usque apicem sensim agustatum, ± S-forme vel fere rectum, 3–6 cm. longum. *Columna* brevis, crassa, circiter 2 mm. longa; androclinium vix excavatum, reclinatum. *Anthera* cucullata, antice in appendicem angustatam apice truncatam decurrens, in toto 3·8–5 mm. longa; pollinia 2, ellipsoidea, 0·8–1·5 mm. longa, stipitibus superne anguste spathulatis inferne angustissimis 3–3·7 mm. longis, viscidio communi ligulato in toto 3·8–6·1 mm. longo, parte indurata oblonga 1–1·7 mm. longa, parte hyalina angustiore 2·8–4·5 mm. longa apice obtuse bidentata. *Fovea* stigmatica transverse oblonga; rostellum porrectum, elongatum, 4–6·5 mm. longum, viscidio amoto profunde bifidum dente brevi interjectum, lobis basi dilatatis fere omnino papillosis. *Capsulae* fusiformes, trigonae, 4 cm. longae, 1 cm. diametro.

Urundi. Bugesera, Feb. 1953, *Liben* 1048; Bugesera, Kindana, Jan. 1954, *Liben* 1074.

Tanganyika Territory. West Usambara Mts., Bumbuli, 1650 m. alt., in heavy shade in rain-forest, March 1941, *Moreau* 874; East Usambara Mts., Kwamkoro, near Amani, 900 m. alt., on coffee trees in clearing in rain-forest, Aug. 1940, *Moreau* 27 (type); Ngua, near Kwamkoro, 1050 m. alt., on isolated trees in forest clearing, March 1941, *Moreau* 27A; Amani, common at 450 m. alt., Jan. 1942, *Greenway* 6446; same locality, 900 m. alt., in evergreen rain-forest on steep mountain slopes, March 1943, *Greenway* 6674; same locality, 840–900 m. alt., on fallen *Chlorophora* and on trees by roadside, April 1950, *Verdcourt* 154; 142; 900 m. alt., on topmost branches of rain-forest trees, March 1941, *Greenway* 6160; Handeni, 600 m. alt., on isolated trees in open grassland, *Moreau* 416; Handeni Distr., Sindeni, 420 m. alt., in woodland near stream, May 1950, *G. R. Williams* 31; Morogoro Distr., Turiani, 500 m. alt., on tree overhanging river, March 1953, *Drummond & Hemsley* 1912; same locality, Nov. 1953, *Paulo* 197; Nguru Mts.,

Maskati track, 900 m. alt., June 1944, *Moreau* 350; Pugu Hills, W. of Dar es Salaam, June 1944, *Griffiths in Moreau* 396.

This species, which is evidently closely allied to *C. arcuata* (Lindl.) Schltr., is common in the region around Amani in the East Usambara mountains. It also occurs in several other adjacent areas as well as in Urundi, where it is separated by a considerable gap from the main centre of distribution. It appears to be a rain-forest species in which respect it differs from *C. arcuata* which usually occurs in savanna regions.

I have seen no specimens of the species collected before 1940, but it is remarkable that it has not been described previously. I can find no direct reference to it in any account by the Germans of the Usambara flora, which seems strange in view of its abundance in the Amani district. Presumably it was identified with *C. arcuata*.

The species may be recognised by the relatively thin and nearly parallel-sided leaves, the small flowers with only slightly curved but relatively long spur and especially the structure of the pollinarium. The two stipites are much less widened than in *C. arcuata*, while the hyaline part of the viscidium is over 2½ times as long as the rather short broad indurated part. On the other hand the anther is beaked in much the same way as in *C. arcuata* and thus differs from the western *C. aschersonii* (Kraenzl.) Schltr.

4. **C. hamata** (*Rolfe*) *Schltr.*, Die Orchid. 596 (1914) & in Beih. Bot. Centralbl. **36**, ii, 130 (1918); Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 461 (1936)

Listrostachya hamata Rolfe in Orch. Rev. **9**, 61 (1901), nomen subnudum, et in Curt., Bot. Mag. **132**, t. 8074 (1906)

Type specimen: Nigeria, Lagos, coll. Mrs. W. T. Martin, flowered in Royal Botanic Gardens, Kew, Dec. 1900.

Distrib.: Ghana, S. Nigeria

This species resembles *C. arcuata* (Lindl.) Schltr., but may be recognised easily by the curled-up apex of the spur. The flowers are medium-sized to rather large (lateral sepals 2–3·5 cm. long) while the leaves are relatively long and narrow (13–25 cm. by 1·5–2·5 cm., rarely to 4 cm.). The beak of the anther is broader than in *C. arcuata* but the pollinarium is very similar to that in the latter species. *C. hamata* is characteristically a forest plant occurring frequently in the crowns of tall trees. I have now seen many gatherings of this species from Southern Nigeria and Ghana.

5. **C. acuminata** (*Rolfe*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 128 (1918); Dandy in Exell, Vasc. Pl. S. Tomé 335 (1944)

Listrostachys acuminata Rolfe in Dyer, Fl. Trop. Afr. **7**, 154 (1897)

Type specimen: Principe, without locality, *Henriques*

Distrib.: Principe, Annobon

This species is clearly near *C. arcuata* (Lindl.) Schltr., of which it may prove eventually to be merely a subspecies. It differs in the very broad leaves and the broad indurated part of the viscidium. It is very desirable that more of this species should be collected so as to determine more exactly its relation to the widely ranging *C. arcuata*. For the moment it seems most convenient to maintain it as a distinct species.

6. **C. seretii** (*De Wild.*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 132 (1918)

Angraecum seretii De Wild. in Bull. Jard. Bot. Brux. **5**, 191 (1916)

Type specimen: Belgian Congo, Suronga, *Seret* 661

Distrib.: Ubangi-Shari, Belgian Congo, Uganda

I had at first thought that this species was conspecific with *C. erythraeae* (Rolfe) Schltr. since both have rather long narrow leaves. If, however, the drawings by Beccari of the flowers of this latter species, which were published by Kraenzlin in Orchis, volume 2, page 50, are accurate and really referable to *C. erythraeae*, then *C. seretii* is clearly distinct from that species.

C. seretii is characterised by the narrow leaves, the medium sized flowers, the markedly but broadly beaked anther and the long indurated part of the pollinarium, which is as long as or distinctly longer than the hyaline part. The species appears to be restricted to the north-eastern part of the Belgian Congo and to the adjacent regions of Ubangi-Shari and Uganda.

7. **C. erythraeae** (*Rolfe*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 130 (1918)

[*Angraecum schimperianum* (non (A. Rich.) Rchb.f.).—Schweinf. in Bull. Herb. Boiss. **2**, app. ii, 90 (1894)]

Listrostachys erythraeae Rolfe in Dyer, Fl. Trop. Afr. **7**, 155 (1897); Kraenzl. in Orchis **2**, 39, fig. 7 (1908)

Type specimen: Eritrea, above Ghinda, *Schweinfurth & Riva* 2148

Distrib.: Eritrea

It is unfortunate that this species was based on a fruiting specimen since the flowers in this genus are so important in classification. It is uncertain whether the flowers drawn by Beccari and published by Kraenzlin (see above reference) really belong to the same species as the type specimen. In any case the drawing of the pollinarium is unlike that of any *Cyrtorchis* which I have seen. It appears as though part of the rostellum was broken off with the pollinarium and thought to be part of the same structure. From this drawing it is not at all clear whether Beccari's plant belonged to sect. *Cyrtorchis*, as seems most likely on other grounds, or to sect. *Homocolleticon*.

In general appearance *C. erythraeae* resembles closely *C. seretii* (De Wild.) Schltr., but until the floral structure of the former is cleared up it is best to keep them distinct. Further collections of *Cyrtorchis* species from Eritrea are badly needed.

8. **C. aschersonii** (*Kraenzl.*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 129 (1918); Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 460 (1936)

Angraecum aschersonii Kraenzl. in Mitt. Deutsch. Schutzgeb. **2**, 157 (1889)

Listrostachys aschersonii (Kraenzl.) Dur. & Schinz, Consp. Fl. Afr. **5**, 48 (1895); Rolfe in Dyer, Fl. Trop. Afr. **7**, 156 (1897)

Angraecum angustifolium De Wild. in Bull. Jard. Bot. Brux. **5**, 181 (1916)

A. subcylindrifolium De Wild., l.c. 192 (1916)

Cyrtorchis angustifolia (De Wild.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 128 (1918)

C. subcylindrifolia (De Wild.) Schltr. l.c. 132 (1918)

Type specimen: French Cameroons, Malimba, *Braun* 83 (now destroyed, but tracing of plant and dissections of flowers in Herb. Kew.).

Distrib.: Sierra Leone, Ghana, S. Nigeria, French Cameroons, Belgian Congo

Examination of the type specimens of all the above concepts shows them to be conspecific. In floral structure there is very close agreement, striking features being the very short dentate projection of the anther in front and the short broad indurated part of the viscidium. The stipites are also not so much widened as in other species of sect. *Cyrtorchis*, in this respect approaching sect. *Homocolleticon*. The flowers are small with a relatively short spur (1·5–4 cm.).

The leaves are always very narrow, scarcely reaching 1·5 cm. at the broadest and usually much narrower. They are often fleshy with the margins incurved and in some cases this may make them appear almost cylindrical. In the same gathering from Ghana (*Westwood* 119) there are specimens which in this respect match the type specimens of De Wildeman's two species, and all intermediates may be found between the narrowest fleshy leaves and the wider relatively flat ones.

The cultivated specimens referred to *Listrostachys henriquesiana* (Ridl.) Rolfe (*Cyrtorchis henriquesiana* (Ridl.) Schltr.) by Rolfe in the 'Flora of Tropical Africa' (**7**, 157: 1897) are actually referable to *C. aschersonii*.

Sect. *Homocolleticon* Summerh.

9. **C. monteiroae** (Rchb.f.) Schltr., Die Orchid. 596 (1914) et in Beih. Bot. Centralbl. **36**, ii, 132 (1918); Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 460 (1936)

Listrostachys monteiroae Rchb.f. in Linnaea **41**, 76 (1877), '*monteirae*'; Rolfe in Dyer, Fl. Trop. Afr. **7**, 156 (1897)

Angraecum antennatum Kraenzl. in Engl., Bot. Jahrb. **17**, 61 (1893)

Listrostachys droogmansiana De Wild. in Belg. Colon. **8**, 425 (1902) & in Ann. Mus. Congo, sér. V, **1**, 24 (1903)

[*Angraecum aschersonii* (non Kraenzl.).—Rendle in Cat. Talb. Nig. Pl. 147 (1913)]

Cyrtorchis droogmansiana (De Wild.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 130 (1918)

Type specimen: Angola, Bembu, *Monteiro*

Distrib.: Sierra Leone, eastwards to Uganda, southwards to Gabon and Angola

This species is characterised by the broad oblanceolate often rather crinkled leaves and the rather long inflorescences in which the flowers are spaced out more than usual in the genus. It is widely spread in the forested regions of the Congo Basin and adjacent areas. There is no doubt from examination of the type specimens or gatherings of the other concepts cited that they are conspecific with *C. monteiroae*. I am accepting the spelling of the epithet (*monteiroae*) as proposed by Schlechter in his revision of the genus (see reference above) as it seems to be the only correct way of forming a genitive from the name Monteiro; *monteirae* must therefore be considered as an unintentional orthographic error.

10. **C. injoloënsis** (*De Wild.*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 131 (1918)

Angraecum injoloënse De Wild. in Bull. Jard. Bot. Brux. **5**, 187 (1916)
A. ealaënse De Wild., l.c. 185 (1916)
Cyrtorchis ealaënsis (De Wild.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 130 (1918)

Type specimen: Belgian Congo, Injolo, *M. Laurent* 1756

Distrib.: Belgian Congo, Uganda

Examination of the type specimens of the above two concepts shows them to be conspecific, and indeed De Wildeman himself mentions no differences, merely stating that they are allied. I have adopted the epithet *injoloënsis* for the species as the type specimen is in a better state of preservation than that of *Angraecum ealaënse*; the two epithets were published simultaneously. The corresponding combinations under *Listrostachys*, cited by De Wildeman, are both in synonymy and consequently are not validly published. From the footnote at the beginning of De Wildeman's paper it is clear that he did not accept *Listrostachys* as a separate genus.

The species is characterised by the long almost parallel-sided leaves up to 40 cm. in length, the long inflorescences and large bracts. The flowers are rather small (sepals 1–1·5 cm. long) with a spur about 2·5 cm. in length.

11. **C. ringens** (*Rchb. f.*) *Summerh.* in Kew Bull. **13**, 87 (1958)

Listrostachys ringens Rchb.f. in Gard. Chron., ser. 2, **10**, 266 (1878); Rolfe in Dyer, Fl. Trop. Afr. **7**, 155 (1897)
Angraecum buchholzianum Kraenzl. in Engl., Bot. Jahrb. **7**, 334 (1886)
A. bistortum Rolfe in Kew Bull. **1893**, 65
Listrostachys buchholziana (Kraenzl.) Dur. & Schinz, Consp. Fl. Afr. **5**, 48 (1895); Rolfe in Dyer, Fl. Trop. Afr. **7**, 157 (1897)
L. hookeri Rolfe in Dyer, Fl. Trop. Afr. **7**, 154 (1897)
L. bistorta (Rolfe) Rolfe, l.c. 155 (1897)
L. ignoti Kraenzl. in Engl., Bot. Jahrb. **51**, 395 (1914)
Cyrtorchis bistorta (Rolfe) Schltr. in Beih. Bot. Centralbl. **36**, ii, 129 (1918); Summerh. in Hutch. & Dalz., Fl. West Trop. Afr. **2**, 460 (1936); Dandy in Exell, Vasc. Pl. S. Tomé 335 (1944)
C. buchholziana (Kraenzl.) Schltr., l.c. 129 (1918)
C. hookeri (Rolfe) Schltr., l.c. 131 (1918)

Type specimen: Cameroons, *Hildebrandt*

Distrib.: Sierra Leone, Liberia, Ghana, Nigeria, British and French Cameroons, S. Tomé, Belgian Congo, Urundi, Uganda, Tanganyika, Southern Rhodesia

When publishing this new combination in 1958 I also made most of the reductions to synonymy listed above. Although I have not seen the type specimen of *Angraecum buchholzianum*, which unfortunately has been destroyed, I have seen two other gatherings from the Cameroons by Zenker which had been determined as the same species at Berlin, presumably by comparison with the type. These agree well with the original description and there is no doubt that they are conspecific with *C. ringens*. The bending of the spur in the original material of *Angraecum bistortum* Rolfe was the result of that organ catching in the bracts as the flowers open. At a later period the spurs on the type plant at Kew straightened out in the normal way so this bend is clearly of no taxonomic significance.

The species has relatively thin oblong or ligulate more or less parallel-sided leaves which are slightly unequally bilobed at the apex, the lobes being broadly rounded. The flowers are borne in inflorescences shorter than or almost equalling the leaves and are of medium size with a scarcely tapering spur 2–4 cm. long. *C. ringens* differs from *C. injoloënsis* (De Wild.) Schltr. in the shorter leaves and inflorescences and from *C. brownii* (Rolfe) Schltr., and *C. praetermissa* Summerh. in the considerably broader leaves.

12. **C. brownii** (*Rolfe*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 129 (1918)

Listrostachys brownii Rolfe in Kew Bull. **1906**, 378
Angraecum latibracteatum De Wild. in Bull. Jard. Bot. Brux. **5**, 188 (1916)
Cyrtorchis latibracteata (De Wild.) Schltr. in Beih. Bot. Centralbl. **36**, ii, 131 (1918)

Type specimen: Uganda, Entebbe, *Brown* 248

Distrib.: French and Belgian Congo, Uganda, Tanganyika

This species may be recognised by the relatively short ligulate but flat and fleshy leaves and the very dense inflorescences with conspicuous broad more or less overlapping bracts. The flowers are small (sepals 9–14 mm. long) with a slightly curved spur 2–3 cm. in length. It is evidently widely distributed in the Congo Forest area, and may yet be found in other forest areas in East Africa.

13. **C. praetermissa** *Summerh.* in Kew Bull. **3**, 279 (1948)

Type specimen: Northern Rhodesia, Mwinilunga Distr., *Milne-Redhead* 3146

Distrib.: Belgian Congo, Urundi, Uganda, Tanganyika, Northern and Southern Rhodesia, Transvaal

This species agrees with *C. brownii* (Rolfe) Schltr. in its small leaves and flowers but the leaves are usually longer and relatively narrower and V-shaped in section. The inflorescences are less dense while the bracts are relatively small and do not overlap one another as in *C. brownii*. The flowers are about the same size as those of *C. brownii*. The species seems to occur usually in savanna or open woodland of *Brachystegia*, etc., but may sometimes be found in rain-forest.

14. **C. henriquesiana** (*Ridl.*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 131 (1918); Dandy in Exell, Vasc. Pl. S. Tomé 335 (1944)

Angraecum henriquesianum Ridl. in Bol. Soc. Brot. **5**, 231 (1887)
Listrostachys henriquesiana (Ridl.) Rolfe in Dyer, Fl. Trop. Afr. **7**, 157 (1897), partim, quoad specim. Princip. tantum

Type specimen: Principe, *Newton*

Distrib.: Principe

Characterised by the very long narrow leaves, not exceeding 6 mm. in breadth. Vegetatively the species closely resembles *C. aschersonii* (Kraenzl.) Schltr. which, however, has quite a different viscidium and belongs to sect. *Cyrtorchis*. Rolfe's description of *L. henriquesiana* in the 'Flora of Tropical Africa' is, as regards the flowers, mainly drawn up from the cultivated specimens which he cites. The viscidium in these plants is, however, very

different from that in the type specimen collected by Newton. On examination they are evidently referable to *C. aschersonii* with which they agree very well. *C. henriquesiana* has small flowers (sepals about 1 cm. long) with somewhat S-shaped spur about 3 cm. in length.

15. **C. crassifolia** *Schltr.* in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1911–12, **1**, 250, fig. 27 (1916)

Type specimen:—Northern Rhodesia, Abercorn, *Fries* 1274

Distrib.: Southern Tanganyika, Belgian Congo, Northern Rhodesia

This species can be recognised easily by the short very fleshy greyish-green leaves, which are usually markedly recurved. The inflorescences are also short, about equalling the leaves. The flowers are small (sepals 7–12 mm. long) with a straight or slightly curved spur 2–2·5 cm. in length. The species is either epiphytic on various trees in open woodland or grows on rocks.

Insufficiently known species

Angraecum crenatum *Rchb.f. ex Williams*, Man. Orch. Pl., ed. 6, 115 (1885)

This is not really properly described. It is said to be like *A. chailluanum* Hook.f. but with smaller flowers and vegetative parts, so presumably it is a *Cyrtorchis*. It is, however, quite impossible from the information to place it accurately in the genus.

Excluded species

C. aberrans *Mansf.* in Notizbl. Bot. Gart. Berlin, **12**, 705 (1935)

Judging from the description this is certainly not referable to the genus *Cyrtorchis*. Unfortunately the type specimen has been destroyed but I have seen several gatherings from Tanganyika Territory which may well be conspecific. These will probably have to be referred to a new genus.

C. refracta (*Kraenzl.*) *Schltr.* in Beih. Bot. Centralbl. **36**, ii, 132 (1918)

Listrostachys refracta Kraenzl. in Engl., Bot. Jahrb. **33**, 74 (1902)

This is referable to the genus *Ancistrorhynchus*, namely, *A. refractus* (Kraenzl.) Summerh.

Dinklageëlla minor *Summerh.*, sp. nov.; a *D. liberica* Mansf. habitu minus robusta, foliis angustioribus, inflorescentiis brevioribus, tepalis angustioribus, labello triente apicali tantum trilobato, calcari minus 3 mm. longo valde inflato facile distinguitur.

Herba epiphytica ± scandens, floribus exceptis glaberrima; caulis elongatus, usque 15 cm. longus vel ultra, teres, 2–3 mm. diametro, laxiuscule foliatus, radices flexuosas tenues griseas ad nodos per totam longitudinem emittens. *Folia* 7–15 mm. distantia, patentia vel erecto-patentia; vagina arcta, internodium fere aequans vel brevior, transverse rugulosa; lamina lanceolato-oblonga vel lanceolato-ligulata, apice fere aequaliter obtuse bilobulata, 1·3–2·7 cm. longa, 5–9 mm. lata, subcoriacea, supra canaliculata, subtus leviter carinata *Inflorescentiae* axillares, patentes vel suberectae,

1·5–2·5 cm. longae, 2–3-florae; pedunculus teres, vaginis paucis arctis 2 basalibus instructus; rhachis leviter fractiflexa; bracteae e basi breviter vaginante late ovatae, obtusae, 2–3 mm. longae, ovario pedicellato satis breviores. *Flores* curvatim patentes, albi; pedicellus cum ovario arcuatus, 5–6 mm. longus, pilis nigris furfuraceis instructus. *Sepalum* intermedium oblongum, obtusum, 5 mm. longum, 2·25 mm. latum; sepala lateralia oblique anguste oblanceolato-oblonga vel ligulata, apice obtusa vel fere rotundata, circiter 5·5 mm. longa, 1·6–1·7 mm. lata; omnia sepala trinervia, extra pilis nigris furfuraceis instructa. *Petala* lineari-oblonga, apice obtusa, 5 mm. longa, 1·25 mm. lata, uni- vel subtrinervia, glabra. *Labellum* valde concavum basi columnam amplectens, ambitu (explanatum) late ovatum, triente apicali trilobatum, in toto 6·5–7·5 mm. longum, 4–4·5 mm. latum; lobus intermedius leviter recurvatus, lanceolato-oblongus, apice tridentatus, 3–3·5 mm. longus, circiter 1·5 mm. latus; lobi laterales erecti, triangulari-ovati, obtusi, 2–2·5 mm. longi, basi 1·5 mm. lati; calcar ex ore angusto valde inflatum, apice breviter recurvatum, 2·6–2·7 mm. longum, circiter 1·5 mm. diametro. *Columna* brevis, apice truncata, 0·75–1 mm. longa, androclinio leviter excavato; anthera hemisphaerica, basi et apice leviter emarginata, polliniis 2 globosis 0·5 mm. diametro, stipite elliptico tenui hyalino 0·4 mm. longo, viscidio oblongo-elliptico 0·2 mm. longo; rostellum breviter incurvatim porrectum, viscidio amoto bidentatum, fovea stigmatica quadrata. *Capsulae* ellipsoideae, 2 cm. longae, fere 1 cm. diametro.

LIBERIA. Ganta, Aug. 1951, *Harley* 1828; Aug. 1957, *Harley* 2158 (type).

GHANA. Aburi, Oct. 1937, *Cox* 86.

The discovery of a second species of this hitherto monotypic genus is of considerable interest. In general vegetative and floral features the two species show good agreement, the differences being set out in the diagnosis. Of especial interest is the structure of the pollinarium. As in *D. liberica* the single stipes is very large and flat, covering practically the whole of the androclinium, from which it has presumably been derived. The viscidium is comparatively small and placed in an upright position between the two teeth of the short rostellum. In *D. minor* the pollinia themselves are quite large, even a little longer than the stipes, whereas in *D. liberica* they are very small, but the general structure of the pollinarium is very similar in the two species.

Tridactyle brevicalcarata *Summerh.* in Kew Bull. **3**, 295 (1948)

In the description of this species the inflorescences are erroneously stated to be 2–6 mm. in length. This should read 2–6 cm. which is in agreement with the conspectus on p. 283 in the same paper.

Flora of California.*—California, the third largest state in the Union, is smaller than Spain which lies in nearly the same latitude and has a similar huge total (about 6,000 species) of flowering plants, but Spain lacks the exaggerated diversity of mountain, moist coastal forest and arid desert found

* *A California Flora.* By P. A. Munz. Pp. 1681, 2 maps, 134 text-figures, colour frontispiece. Berkeley and Los Angeles: California University Press and Cambridge: The University Press, 1959. Price 86s. 6d.

in the five main Biotic Provinces recognized by Prof. Munz. His new Flora succeeds W. L. Jepson's 'Manual' (1926), and in the intervening period we have had his own 'Manual of Southern California Botany' (1933) and H. L. Mason's 'Flora of the Marshes of California' (1957), while Jepson's large-scale 'Flora of California', the first part of which appeared in 1909, seems to have ended with the issue of the second part of the third volume in 1943 and the author's death in 1946.

This Flora is of outstanding interest because of its ecological bias. Apart from the five Biotic Provinces (which replace the Merriam Life Zone system) and eleven major Vegetation Types, California is given twenty-nine Plant Communities which are fully classified in the Introduction, while throughout the text the native species are assigned to one or more of these, together with a description of habitat, altitudinal range and distribution within the State. Chromosome numbers (with author citations) are given when known, and references to revisions follow generic descriptions. The keys for genera, species and varieties seem to have been very carefully prepared. There are some large genera in California, and Prof. Munz acknowledges help with some of these, for instance, *Carex* (144 species, contributed by J. T. Howell) and *Astragalus* (93 species, by R. C. Barneby). *Lupinus* provides 82 species even after the reduction of many of the taxa proposed by C. Piper Smith. The author's generic concepts and nomenclature are sometimes conservative or, some would say, reactionary: *Mahonia* is included in *Berberis*, *Erophila* in *Draba*, *Gentianella* in *Gentiana* and *Calystegia* in *Convolvulus*, while *Hutchinsia* reappears and *Centunculus* survives.

It is stated on the dust-cover that the Flora 'abandons the conventional family order and attempts to follow that suggested by recent contributions from morphology and phylogeny'. This order was worked out by Prof. Munz's collaborator, Dr. David D. Keck, who also contributed the glossary and the list of authors with their dates and abbreviations, as well as the treatment of about half of the *Compositae*. It would indeed be unconventional if it were supposed to be phylogenetic: the *Labiatae* are followed by the *Crassulaceae*, and the *Urticaceae* by the *Lythraceae* and *Onagraceae*.

The Introduction has a County map and a topographic map of California, while the 134 text figures serve to illustrate the characters of orders, families or subdivisions of families, not of individual genera or species. Prof. Munz is to be congratulated on completing this excellent work which, no doubt inevitably, is printed on the same thin paper as Fernald's edition of Gray's 'Manual'.

N. Y. Sandwith

The Orchids.*—Many books dealing entirely with orchids have been published, but nearly all of them are either devoted almost exclusively to cultivated species and hybrids and intended primarily for orchid growers, or are in the nature of 'Floras', describing and classifying the species occurring in some part or other of the world. The only book which can lay claim to treat the family reasonably comprehensively from a general scientific standpoint is

* *The Orchids: A Scientific Survey*. Edited by C. L. Withner. Pp. ix + 648, 61 plates, 88 figures. New York: The Ronald Press Company, 1959. Price $14.

Schlechter's classic 'Die Orchideen', the two editions of which appeared so long ago as 1914 and 1927 respectively. Apart from being written in German this book also is primarily intended for readers who grow orchids, containing, for instance, a very extensive section describing the commonest species to be found in cultivation.

The appearance of the book reviewed here is therefore of especial interest since it is virtually the first book on orchids which attempts to describe and evaluate at all comprehensively our progress so far in the various fields of scientific enquiry into this large and remarkable family of plants. The book is in the nature of a symposium, different authors writing about those aspects of research into orchids with which they are especially familiar. It will be seen from a list of the subjects dealt with in the book, including classification, variation, embryology, cytology, hybridisation and inheritance, physiology, mycorhiza, photo-periodic and temperature responses, fungal, bacterial and virus diseases, pests, and a special chapter on *Vanilla*, that a wide field is covered. It is unfortunate, however, that the important subjects of ecology and plant distribution have not been included; indeed one receives a strong impression that most of the contributors are more familiar with orchids in the laboratory or greenhouse than in their natural haunts.

As might be expected from the variety of authors and subjects, the various contributions are somewhat uneven in quality. That by Burgeff on mycorhiza is an excellent presentation of our present knowledge in this very complex subject, while the chapters on cytology and hybridisation, for instance, bring together a large amount of useful information. It is difficult to see, however, what the numerous drawings in Mrs. Adam's chapter prove except to show that in the *Orchidaceae* there is an enormous range of variation as regards floral and vegetative structure, a fact of which any serious student of the family could scarcely be ignorant. Again, the authors of the chapter on *Vanilla* seem to be quite unaware of the existence of Bouriquet's comprehensive book on the genus, published in 1955, which deals at length with almost every aspect of the subject. A charge which possibly can be levelled at some of the contributors is that they are too much concerned with ensuring that references are made to all the work which has been published and do not devote enough space to discussing the relationship of these investigations to one another and to drawing useful conclusions for the reader's benefit. It may be, however, that in some fields the amount of work done so far is insufficient to permit of such conclusions being drawn. Nevertheless, the reviewer feels that in a book like the present one an assessment of the significance of our knowledge in the various fields covered should have been considered to be a *sine qua non*.

It is also a pity that the various contributions were not looked over by a competent taxonomist to ensure that the species referred to in the text were given the same name or even placed in the same genus and also to see that the names used are the correct ones. Such action would have prevented glaring errors such as '*Orchis*' *muscifera* (p. 114), '*Aërangis*' *grandiflora* (p. 116) and *Cephalanthera grandiflora* on page 171 followed by *C. damasonium* on the next page, these two being different names for the same species. This confusion of names is particularly noticeable in the list of chromosome numbers in the appendix where we find, for example, separate records given for *Serapias longipetala* and *S. vomeracea* (p. 540), *Platanthera obtusata* (p.

545) and *Habenaria obtusata* (p. 547), *Epipactis helleborine* and *E. latifolia* (p. 549), *Spiranthes autumnalis* and *S. spiralis* (p. 550) and *Corallorhiza innata* and *C. trifida* (p. 565), the pairs of names in each case representing the same species!

Nevertheless the book brings together in one place an immense amount of classified information about the scientific work which has been carried out on the family, accompanied by extensive bibliographies at the end of each chapter. The general format is clear and pleasant to use while the diagrams and illustrations are well reproduced. It should be noted, however, that in fig. 9–6 on page 375 the letters B & C have been transposed on the illustration. It is to be hoped that if a further edition of the book is prepared it may be possible to deal more fully with orchids as they occur in nature.

V. S. SUMMERHAYES

Index Kewensis: Supplement XII (1951–1955).*—Our old and valued quinquennial friend once more makes his welcome appearance. Whereas the number of entries in earlier supplements—at least in those for 1911–1940 remained rather steady at about 31,000–32,000 entries, the double supplement for 1941–1950 comprised but 35,000, and the present 5-year supplement includes fewer than 21,000 names. In his preparatory note, the Director of Kew comments on this apparent falling off in the number of new species (or at least new names) put forward by botanists, and suggests that this may be due not only to the increasing exhaustion of botanically 'unknown' areas, but also to a more cautious attitude towards 'novelties' on the part of taxonomists themselves. In the new Supplement, it is interesting to note that, in regard to new generic names, the *Leguminosae* and *Compositae* easily head the list, with 43 and 33 new names respectively.

H. K. AIRY SHAW

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* *Index Kewensis Plantarum Phanerogamarum Supplementum duocecimum, nomina et synonyma omnium generum et speciorum ab inito anni MDCCCCLI usque ad finem annui MDCCCCLV nonnulla etiam antea edita complectus*, ductu et consilio Georgii Taylor confecerunt Herbarii Horti Regii Botanici Kewensis curatores. Pp. iv + 157. Oxford: The Clarendon Press, 1959. Price 75/-.